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Source Assessment: Overview and Prioritization of Emissions from Textile Manufacturing

Monsanto Research Corp, Dayton, Ohio

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SOURCE ASSESSMENT: OVERVIEW AND PRIORITIZATION OF EMISSIONS FROM TEXTILE MANUFACTURING

Industrial Environmental Research Laboratory
Office of Research and Development
U.S. Environmental Protection Agency
Research Triangle Park, North Carolina 27711

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16. ABSTRACT The report gives an overview of air pollution emission levels and a ranking of the public health hazard potential of textile manufacturing operations. The textile industry was defined and categorized by Bureau of the Census Standard Industrial Classification (SIC) Codes. Flow charts of production were developed along with production rates per SIC code. Sources of emissions were defined and emission quantities computed on the basis of an extensive literature survey and engineering analysis. Mass emissions from textile sources were determined on a state-by-state and national basis for criteria pollutants (carbon monoxide, particulate matter, nitrogen oxides, hydrocarbons, and sulfur dioxide). The health hazard potential of each source was quantified through impact factors based on downwind exposure to concentrations of pollutants in relation to hazard factors for those pollutants.

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a. DESCRIPTORS		b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group	
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Textile Industry	Carbon Monoxide	Stationary Sources	11E	07B
Textile Processes	Dust	Source Assessment	13H	11G
Emission	Nitrogen Oxides	Health Hazards		
Ranking	Hydrocarbons	Particulate	12B	07C
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PREFACE

The Industrial Environmental Research Laboratory (IERL) of EPA has the responsibility for insuring that pollution control technology is available for stationary sources to meet the requirements of the Clean Air Act, the Federal Water Pollution Control Act and solid waste legislation. If control technology is unavailable, inadequate, uneconomical or socially unacceptable, then financial support is provided for the development of the needed control techniques for industrial and extractive process industries. The Chemical Processes Branch of the Industrial Processes Division of IERL has the responsibility for investing tax dollars in programs to develop control technology for a large number (~500) of operations in the chemical industries.

Monsanto Research Corporation (MRC) has contracted with EPA to investigate the environmental impact of various industries which represent sources of pollution in accordance with EPA's responsibility as outlined above. Dr. Robert C. Binning serves as MRC Program Manager in this overall program entitled "Source Assessment," which includes the investigation of sources in each of four categories: combustion, organic materials, inorganic materials, and open sources. Dr. Dale A. Denny of the Industrial Processes Division at Research Triangle Park serves as EPA Project Officer. Reports prepared in this program are of three types: Source Assessment Documents, State-of-the-Art Reports, and Special Project Reports.

Source Assessment Documents contain data on emissions from specific industries. Such data are gathered from the literature, government agencies and cooperating companies. Sampling and analysis are also performed by the contractor when the available information does not adequately characterize the source emissions. These documents contain all of the information necessary for IERL to decide whether a need exists to develop additional control technology for specific industries.

State-of-the-Art Reports include data on emissions from specific industries which are also gathered from the literature, government agencies and cooperating companies. However, no extensive sampling is conducted by the contractor for such industries. Sources in this category are considered by EPA to be of insufficient priority to warrant complete assessment for control technology decision making. Therefore, results from such studies are published as State-of-the-Art Reports for potential utility by the government, industry, and others having specific needs and interests.

Special projects provide specific information or services which are applicable to a number of source types or have special utility to EPA but are not part of a particular source assessment study. This special project report, "Source Assessment: Overview and Prioritization of Emissions from Textile Manufacturing" was prepared to provide a general summary of textile manufacturing, and to furnish information on individual textile subcategories.

CONTENTS

Sections		Page
Preface		iii
Figures		vi
Tables		vii
I	Introduction	1
II	Source Listings and Prioritization	3
	A. Source Listings	3
	1. Overview Matrix	3
	2. Special Textile Source Listings	4
	B. Prioritization	4
	1. Source Assessment Program	4
	2. Textile Manufacturing Prioritization	5
III	Textile Manufacturing	6
	A. Classification of Source Types	6
	B. Air Pollution Source Types	10
	1. Textile Industry Operations	10
	2. SIC Classifications of Operations	16
	C. State-by-State and National Listing	16
	D. Prioritization	115
IV	Glossary	121
V	Conversion Factors	128
VI	References	129

FIGURES

No.		Page
1	Fibers Used in the Textile Industry	15
2	General Flow Diagram of Materials in the Textile Industry	17
3A	Flowchart for Man-Made Fiber--Filament, Fibers, and Tow to Yarn (Including Bonded Fabrics)	18
3B	Flowchart for Man-Made Fiber--Yarn to Fabric	19
3C	Flowchart for Man-Made Fiber--Fabric to Finished Fabric	20
4A	Flowchart for Vegetable Fibers (Cotton)--Fiber to Yarn	21
4B	Flowchart for Vegetable Fibers (Cotton)--Yarn to Fabric	22
4C	Flowchart for Vegetable Fibers--Fabric to Finished Fabric	23
5A	Flowchart for Animal Fibers--Fiber to Yarn (Including Felt Fabric)	24
5B	Flowchart for Animal Fibers--Yarn to Fabric	25
5C	Flowchart for Animal Fibers--Fabric to Finished Fabric	26
6	Primary Products Route--Man-Made and Silk Fibers	27
7	Primary Products Route--Cotton and Vegetable Fibers	28
8	Primary Products Route--Wool and Animal Fibers	29
9	Prioritization Form Used for State-by-State and National Listings	43
10	Prioritization Form Used for State-by-State and National Listings	44

TABLES

No.		Page
1	Breakdown of Major Group 22, Textile Mill Products	8
2	Textile Weights Per Linear Unit	8
3	Four-Digit Codes Within SIC Code 225, Knitting Mills	9
4	Four-Digit Codes Within SIC Code 229, Miscellaneous Textile Goods	10
5	Categorization and Production Rates of Sources Within the Textile Industry	11
6	Definitions of Source Group Categories in the Textile Industry	12
7	Air Pollution Source Types in Textile Manufacturing SIC Code 2211, Cotton Weaving Mills	30
8	Air Pollution Source Types in Textile Manufacturing--SIC Code 2221, Manmade Fiber and Silk Weaving Mills	30
9	Air Pollution Source Types in Textile Manufacturing--SIC Code 2231, Wool Weaving and Finishing Mills	31
10	Air Pollution Source Types in Textile Manufacturing--SIC Code 2241, Narrow Fabric Mills	32
11	Air Pollution Source Types in Textile Manufacturing--SIC Code 225, Knitting Mills	32
12	Air Pollution Source Types in Textile Manufacturing--SIC Code 2261, Cotton Finishing Plants	34
13	Air Pollution Source Types in Textile Manufacturing--SIC Code 2262, Man-Made Fiber and Silk Finishing Plants	34
14	Air Pollution Source Types in Textile Manufacturing--SIC Code 3269, Finishing Plants, N.E.C.	35

TABLES (Continued)

No.		Page
15	Air Pollution Source Types in Textile Manufacturing--SIC Code 227, Floor Covering Mills	36
16	Air Pollution Source Types in Textile Manufacturing--SIC Code 2281, Yarn Mills Except Wool	37
17	Air Pollution Source Types in Textile Manufacturing--SIC Code 2282, Throwing and Winding Mills	38
18	Air Pollution Source Types in Textile Manufacturing--SIC Code 2283, Wool Yarn Mills	38
19	Air Pollution Source Types in Textile Manufacturing--SIC Code 2284, Thread Mills	39
20	Air Pollution Source Types in Textile Manufacturing--SIC Code 2291, Felt Goods Except Woven Felts and Hats	39
21	Air Pollution Source Types in Textile Manufacturing--SIC Code 2292, Lace Goods	40
22	Air Pollution Source Types in Textile Manufacturing--SIC Code 2293, Paddings and Upholstery Filling	40
23	Air Pollution Source Types in Textile Manufacturing--SIC Code 2294, Processed Textile Waste	40
24	Air Pollution Source Types in Textile Manufacturing--SIC Code 2295, Coated Fabrics Not Rubberized	41
25	Air Pollution Source Types in Textile Manufacturing--SIC Code 2296, Tire Cord and Fabric	41
26	Air Pollution Source Types in Textile Manufacturing--SIC Code 2297, Nonwoven Fabrics	41
27	Air Pollution Source Types in Textile Manufacturing--SIC Code 2298, Cordage and Twine	41
28	Air Pollution Source Types in Textile Manufacturing--SIC Code 2299, Miscellaneous Textile Goods	41
29	State-by-Stage Listing of Criteria Pollutant Emissions from Textile Manufacturing Sources	46
30	Total Criteria Pollutant Emissions from Textile Manufacturing Sources in Each State	104
31	Mass Emissions of Criteria Pollutants Per State and Percent of U.S. Total	108

TABLES (Continued)

No.		Page
13	National Listing of Criteria Emissions from Textile Manufacturing Sources	110
14	Prioritization of Textile Manufacturing Sources with Respect to Source Type	116
14	Impact Factors for Textile Manufacturing Sources by SIC Code	117
15	Prioritization of Textile Manufacturing Sources with Respect to SIC Code	121

SECTION I

INTRODUCTION

This report provides an overview and prioritization of mass emissions from textile manufacturing in order to permit selection of specific pollution sources for detailed assessment.

Operations in textile manufacturing are defined as any processes which take a yarn, filament, fiber, or tow and create a final or intermediate product. In this study, such operations are limited to those which occur on the plant site and which emit air pollutants.

With respect to the Source Assessment Program, textile manufacturing was originally included in the two source types "Fabric Scouring" and "Surface Coating - Fabric Treatment." These sources were contained in the organic chemicals category of the Overview Matrix.[1] Subsequently, these two textile source types were replaced by various textile subcategories and incorporated into a revised Overview Matrix.[2]

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[1] Special Project Report, Overview Matrix. Monsanto Research Corporation, Dayton, Ohio, EPA Contract 68-02-1874, 7 July 1976. 52 p.

[2] Quill, R. P., and E. C. Eimutis. Source Assessment: Overview Matrix for National Criteria Pollutant Emissions. EPA-600/2-77-107c, U.S. Environmental Protection Agency, Research Triangle Park, July 1977. 61 p.

In order to begin detailed assessments of air pollution from textile manufacturing sources, each subcategory requires an overview of mass emissions and a prioritization of hazard potentials. The size and complexity of the textile industry necessitates the creation of special source listings to provide the in-depth review of emissions. At present, data were compiled only for those sources for which emissions information was readily available. Hence, this report presents a preliminary source listing and prioritization of textile sources. A more comprehensive and organized listing would require a more intensive research effort.

SECTION II

SOURCE LISTINGS AND PRIORITIZATION

A. SOURCE LISTING

In the Source Assessment Program, emissions data for criteria pollutants from various source types are listed in special formats. In addition, a relative ranking (prioritizing) of source types based on their potential environmental impact is developed. In this project, special source and prioritization listings were produced specifically for use in evaluating textile manufacturing sources. The listings used in the Source Assessment Program and the special listings produced for the textile industry are briefly compared below.

1. Overview Matrix

In the Source Assessment Program, the Overview Matrix[1,2] is an alphabetized listing of all sources in MRC's data base and their mass of criteria emissions (particulates, sulfur dioxide, nitrogen oxides, hydrocarbons, and carbon monoxide). For each source type, the following information is provided: (1) annual mass of criteria emissions, (2) percent contribution of a particular criteria pollutant based on the total amount of that pollutant emitted from all stationary source types in our data base, and (3) percent contribution of a particular criteria pollutant based on the amount of that pollutant emitted from stationary and mobile sources. The

Overview Matrix is revised periodically as additional or improved data become available.

2. Special Textile Source Listings

For the purpose of this report, special listings of textile source types were prepared in order to provide a general summary of textile manufacturing and to provide information on individual textile subcategories. As shown later in Section III.C, operations were tabulated by Standard Industrial Classification (SIC)[1] for potential sources of air pollution in textile manufacturing. Two special listings, different from the Overview Matrix, were compiled: (1) A state-by-state listing of criteria emissions from textile manufacturing was developed, which shows the percent contribution of a particular criteria pollutant based on the total amount of that pollutant emitted from all textile sources in the state; and (2) a national listing of criteria emissions from textile manufacturing was developed, which shows the percent contribution of a particular criteria pollutant based on the total amount of that pollutant emitted from all textile sources in the nation and, similarly, from all stationary sources in our data base. The method used for preparing these special textile source listings and the listings themselves are provided in Section III.C.

B. PRIORITIZATION

1. Source Assessment Program

In the Source Assessment Program, prioritization listings were developed to aid in the selection of specific sources

[1]Standard Industrial Classification Manual 1972, U.S. Government Printing Office, Washington, D.C., 1972. 649 p.

of emissions for detailed assessment.[4] Air pollution sources were rank ordered or prioritized by computing a relative environmental impact factor for each source type. A priority listing was thus developed for each of the four categories: combustion, organic materials, inorganic materials, and open sources.

3. Textile Manufacturing Prioritization

For the purpose of this report, special prioritization listings of textile source types by SIC Code and by specific source type were developed to further aid in selecting specific sources for detailed study. The procedure used for these special prioritizations and the resultant listings are provided in Section III.D.

[4]Eimutis, E. C. Source Assessment: Prioritization of Stationary Air Pollution Sources - Model Description. U.S. Environmental Protection Agency, Research Triangle Park, EPA-600/2-76-012a. February 1976. 77 p.

SECTION III

TEXTILE MANUFACTURING

A. CLASSIFICATION OF SOURCE TYPES

The SIC Manual[1] defines industries in accordance with the composition and structure of the economy and covers the entire field of economic activities. The Census of Manufactures, published individually by the U.S. Department of Commerce, provides statistics for groups of related industries. In the SIC system, industries and the operations within industries are coded. Statistics on production, consumption, and other parameters are compiled for each of the codes.

The coding system begins with a 2-digit Major Group code, and groupings become more specific up to a 7-digit code. Major Group 22, "Textile Mill Products," approximately covers the textile manufacturing industry, with the exception of asbestos textiles. Within Major Group 22, there are nine 3-digit codes. These 3-digit codes are usually further subdivided with the addition of digits. Major Group 22 is thus further classified and ultimately results in 7-digit codes.

In order to determine the degree of subdivision that most appropriately fits the pattern of the Source Assessment Program, it was necessary to examine the codes with respect to their coverage of the individual operations as well as the industry. The nine 3-digit codes within the Major

Group 22 are listed in Table 1. Total mass production rates and percentage by weight of the textile manufacturing industry are provided for each 4-digit code. Production rates were obtained by applying conversion factors to the linear yardage statistics reported by the U.S. Department of Commerce's Census of Manufactures.[5-10] The conversion factors in Table 2 were used.[11]

Table 1 indicates that SIC Code 223 contains less than 1% of the total production. Therefore, a further breakdown of this source group will not be necessary. SIC Codes 221, 222, and 224 cannot be broken down further since only one 4-digit code is listed for each group. (SIC Codes 2211, 2221, and 2241). SIC Code 225 contains seven 4-digit codes which are listed

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[5]1972 Census of Manufactures, Industry Series (SIC Industry Groups 221, 222, 223, and 224), Weaving Mills. MC72(2)-22A, U.S. Department of Commerce, Washington, D.C., January 1975. 15 p.

[6]1972 Census of Manufactures, Industry Series (SIC Industry Group 225), Knitting Mills. MC72(2)-22B, U.S. Department of Commerce, Washington, D.C., April 1975. 42 p.

[7]1972 Census of Manufactures, Industry Series (SIC Industry Group 226), Dyeing and Finishing Textiles, Except Wool Fabrics and Knit Goods. MC72(2)-22C, U.S. Department of Commerce, Washington, D.C., January 1975. 25 p.

[8]1972 Census of Manufactures, Industry Series (SIC Industry Group 227), Floor Covering Mills. MC72(2)-22D, U.S. Department of Commerce, Washington, D.C., October 1974. 17 p.

[9]1972 Census of Manufactures, Industry Series (SIC Industry Group 228), Yarn and Thread Mills. MC72(2)-22E, U.S. Department of Commerce, Washington, D.C., January 1975. 27 p.

[10]1972 Census of Manufactures, Industry Series (SIC Industry Group 229), Miscellaneous textile Goods. MC72(2)-22F, U.S. Department of Commerce, Washington, D.C., December 1974. 14 p.

[11]Personal communication. Dr. John J. Porter, Clemson University, College of Industrial Management and Textile Science, Department of Textiles, March 21, 1976.

Table 1. BREAKDOWN OF MAJOR GROUP 22, TEXTILE MILL PRODUCTS

SIC Code	Title	Annual production rate[a,b] 10^9 kg/yr	(10^6 tons/yr)	Percentage of total
221	Cotton Weaving Mills	2.2	(2.4)	7
222	Man-made Fiber and Silk Weaving Mills	3.9	(4.3)	12
223	Wool Weaving and Finishing Mills	0.09	(0.1)	<1
224	Narrow Fabric Mills	1.6	(1.75)	5
225	Knitting Mills	2.3	(2.55)	7
226	Dyeing And Finishing Textiles, Except Wool Fabrics and Knit Goods	4.5	(4.95)	14
227	Floor Covering Mills	1.8	(2)	5
228	Yarn and Thread Mills	2.8	(3.05)	11
229	Miscellaneous Textile Goods	12.7	(14)	39
TOTAL		32.0	(35.9)	100

[a] Fiber, yarn and fabrics.

[b] 1 kg = 10^3 grams = 2.205 pounds = 0.0011 short tons (short tons are designated "tons" in this document); other conversion factors are presented in Section V.

Table 2. TEXTILE WEIGHTS PER LINEAR UNIT[1]

Cotton	0.35 kg/m (0.702 lb/yd)
Man-made fiber	0.66 kg/m (1.34 lb/yd)
Wool	0.58 kg/m (1.16 lb/yd)

in Table 1. The operations within each of these 4-digit codes are basically identical, and the 3-digit code 225 will be retained in categorizing the industry.

Table 1. FOUR-DIGIT CODES WITHIN SIC CODE 225, KNITTING MILLS

SIC Code	Title
2251	Women's Hosiery, Except Socks
2252	Hosiery, N.E.C.[4]
2253	Knit Outerwear Mills
2254	Knit Underwear Mills
2257	Circular Knit Fabric Mills
2258	Warp Knit Fabric Mills
2259	Knitting Mills, N.E.C.[4]

[4]Not elsewhere classified.

SIC Code 226 (Table 1) can be further divided into SIC Codes 2261, Cotton Finishing Plants; 2262, Man-Made Fiber and Silk Finishing Plants; and 2269, Finishing Plants, N.E.C. (not elsewhere classified). These groupings contain different operations and as such will be categorized separately within the textile industry. SIC Code 227, Floor Covering Mills, contains three 4-digit codes: SIC Codes 2271, Woven Carpets and Rugs; 2272, Tufted Carpets and Rugs; and 2279, Carpets and Rugs, N.E.C. SIC Code 2272, Tufted Carpets and Rugs, accounts for 97% of the yarns and fibers consumed in SIC Code 227. However, the SIC Code 227 classification will be retained due to the similarities of operations within the 4-digit codes. If a detailed assessment of this source is undertaken, SIC Code 2272 could represent all of SIC Code 227. In SIC Code 228, Yarn and Thread Mills, there are four 4-digit codes: SIC Codes 2281, Yarn Mills Except Wool; 2282, Throwing and Winding Mills; 2283, Wool Yarn Mills; and 2284, Thread Mills. Within SIC Code 229, Miscellaneous Textile Goods, there are nine 4-digit

codes. Due to the lack of similarities in operations, all nine codes must be used in the categorization. The 4-digit codes within SIC Code 229 are listed in Table 4.

Table 4. FOUR-DIGIT CODES WITHIN SIC CODE 229, MISCELLANEOUS TEXTILE GOODS

SIC Code	Title
2291	Felt Goods Except Woven Felts and Hats
2292	Lace Goods
2293	Paddings and Upholstery Filling
2294	Processed Textile Waste
2295	Coated Fabrics Not Rubberized
2296	Tire Cord and Fabric
2297	Nonwoven Fabrics
2298	Cordage and Twine
2299	Textile Goods, N.E.C.

The final degree of subdivision of the textile industry that most appropriately fits the Source Assessment Program is shown in Table 5. Five-digit codes will not be used to subdivide the industry since these codes generally specify products and not operations. Definitions of these source groups (Table 5) comprising the textile industry are presented in Table 6.

B. AIR POLLUTION SOURCE TYPES

1. Textile Industry Operations

The various types of fibers used in the textile industry are categorized in Figure 1.[1] These fibers, with the exception

[1] Cook, J. Gordon. Handbook of Textile Fibers - 1. Natural Fibers, fourth edition. W. S. Cowell, Ltd., Great Britain, 1968. p. xxvii.

Table 5. CATEGORIZATION AND PRODUCTION RATES OF SOURCES WITHIN THE TEXTILE INDUSTRY

SIC Code	Title	Production rate, 10^6 kg/yr	Production rate, (10^3 tons/yr)	Percentage of industry[a]
2211	Cotton Weaving Mills	2,200	(2,400)	6.7
2221	Man-Made Fiber and Silk Weaving Mills	3,900	(4,300)	12.0
2231	Wool Weaving and Finishing Mills	95	(105)	0.3
2241	Narrow Fabric Mills	1,600	(1,800)	4.9
225	Knitting Mills	2,324	(2,556)	7.1
2261	Cotton Finishing Mills	1,400	(1,540)	4.3
2262	Man-Made Fiber and Silk Finishing Mills	2,900	(3,200)	9.0
2269	Finishing Mills, N.E.C.	150	(170)	0.4
227	Floor Covering Mills	1,800	(2,000)	5.6
2281	Yarn Mills Except Wool	2,740	(3,000)	8.4
2282	Throwing and Winding Mills	640	(700)	1.9
2283	Wool Yarn Mills	110	(120)	0.3
2284	Thread Mills	50	(55)	0.2
2291	Felt Goods Except Woven Felts and Hats	170	(190)	0.5
2292	Face Goods	14	(15)	<0.1
2293	Paddings and Upholstery Filling	200	(220)	0.6
2294	Processed Textile Waste	170	(190)	0.5
2295	Coated Fabrics Not Rubberized	800	(880)	2.5
2296	Tire Cord and Fabric	310	(340)	0.9
2297	Nonwoven Fabrics	11,000	(12,100)	33.4
2298	Cordage and Twine	100	(110)	0.3
2299	Textile Goods, N.E.C.	5	(6)	<0.1
TOTAL		32,678	(35,997)	

[a]Percentages rounded off.

Table 6. DEFINITIONS OF SOURCE GROUP CATEGORIES IN THE TEXTILE INDUSTRY

SIC code	Source	Definition
2211	Cotton Weaving Mills	Mills weaving fabrics over 12 in. in width, wholly or chiefly cotton
2221	Man-Made Fiber and Silk Weaving Mills	Mills weaving fabrics over 12 in. in width, wholly or chiefly of silk and man-made fibers, including glass
2231	Wool Weaving and Finishing Mills	Mills weaving fabrics over 12 in. in width, wholly or chiefly by weight of wool, mohair, or similar animal fibers; in dyeing and finishing woven wool fabrics or in dyeing wool, tops, or yarn; and in chrooking and sponging wool goods for the trade
2241	Narrow Fabric Mills	Mills weaving or braiding fabrics 12 in. in width or narrower of cotton, wool, silk, and man-made fibers, including glass fibers. Mills also weaving or braiding fabrics 12 in. in width or narrower of fabric covered elastic yarn are also included in this industry.
225	Knitting Mills	Mills knitting, dyeing, or finishing hosiery, outerwear, underwear, circular knit fabric, warp knit fabric, and other knitted articles
2261	Cotton Finishing Plants	Mills finishing purchased cotton broadwoven fabrics or finishing such fabrics on a commission basis. This includes bleaching, dyeing, printing, mechanical and chemical finishing, and sponging and shrinking cotton for the trade.
2262	Man-Made Fiber and Silk Finishing Plants	Mills finishing purchased man-made fiber and silk broadwoven fabrics or finishing such fabrics on a commission basis. This includes bleaching, dyeing, printing, and mechanical finishing.

(continued)

Table 6 (continued).

SIC code	Source	Definition
2269	Finishing Plants, N.E.C.	Mills dyeing and finishing textiles not elsewhere classified, such as bleaching, printing, and finishing raw stock, yarn, braided goods, and narrow fabrics except wool and knit fabrics
227	Floor Covering Mills	Mills weaving carpets and rugs from yarn, tufting carpets and rugs from fiber, and manufacturing rugs, carpets, art squares, floor mattings, doormats and mattings from twisted paper, grasses, reed, rush, sisal, jute, or rags
2281	Yarn Mills Except Wool	Mills spinning yarn wholly or chiefly by weight of cotton, man-made fibers, or silk staple
2282	Throwing and Winding Mills	Mills texturizing, throwing, twisting, winding, or spooling yarn chiefly (by wt) cotton, man-made fibers, or silk
2283	Wool Yarn Mills	Mills spinning, twisting, winding, or spooling yarn (including carpet and rug yarn) wholly or chiefly (by wt) wool, mohair, or similar animal fibers
2284	Thread Mills	Mills manufacturing thread from natural or man-made fiber except flax and wool
2291	Felt Goods Except Woven Felts and Hats	Mills manufacturing pressed felt, regardless of fiber, by means of heat, moisture, and pressure; and making punched felt for rugs, cushions, and other products from hair, jute, wool, or other fibers by the needle loom process
2292	Lace Goods	Mills manufacturing lace machine products and those primarily engaged in dyeing and finishing lace goods

(continued)

Table 4 (continued).

SIC code	Source	Definition
2392	Padding and Upholstery Filling	Mills manufacturing batting, padding, wadding, and filling for upholstery, pillows, quilts, and apparel from curled hair, cotton mill waste, jute, hemp tow, flax tow, kapok, and related materials
2394	Processed Textile Waste	Mills processing textile waste for spinning, padding, batting, or other uses; and in recovering textile fibers from diggings and rags; in cutting cloth from waste, recovered fibers, or raw fiber stock; and in manufacturing cotton and twisted jute packing
2395	Coated Fabrics Not Rubberized	Mills manufacturing coated and impregnated textiles and in the special finishing of textiles such as rendering and waxing
2396	Tire Cord and Fabrics	Mills manufacturing cord and fabric for use in reinforcing rubber tires, industrial belting, fuel cells, and similar uses
2297	Nonwoven Fabrics	Mills manufacturing nonwoven fabrics by bonding and/or interlocking of fibers[s] by mechanical, chemical, thermal, or solvent means or combinations thereof
2298	Cordage and Twine	Mills manufacturing rope, cable, cordage, twine, and related products from abaca, sisal, henequin, hemp, cotton, paper, jute, flax, man-made fibers including glass and other fibers
2299	Textile Goods, N.E.C.	Mills manufacturing linen goods, jute goods except felts, and other textile goods not elsewhere classified

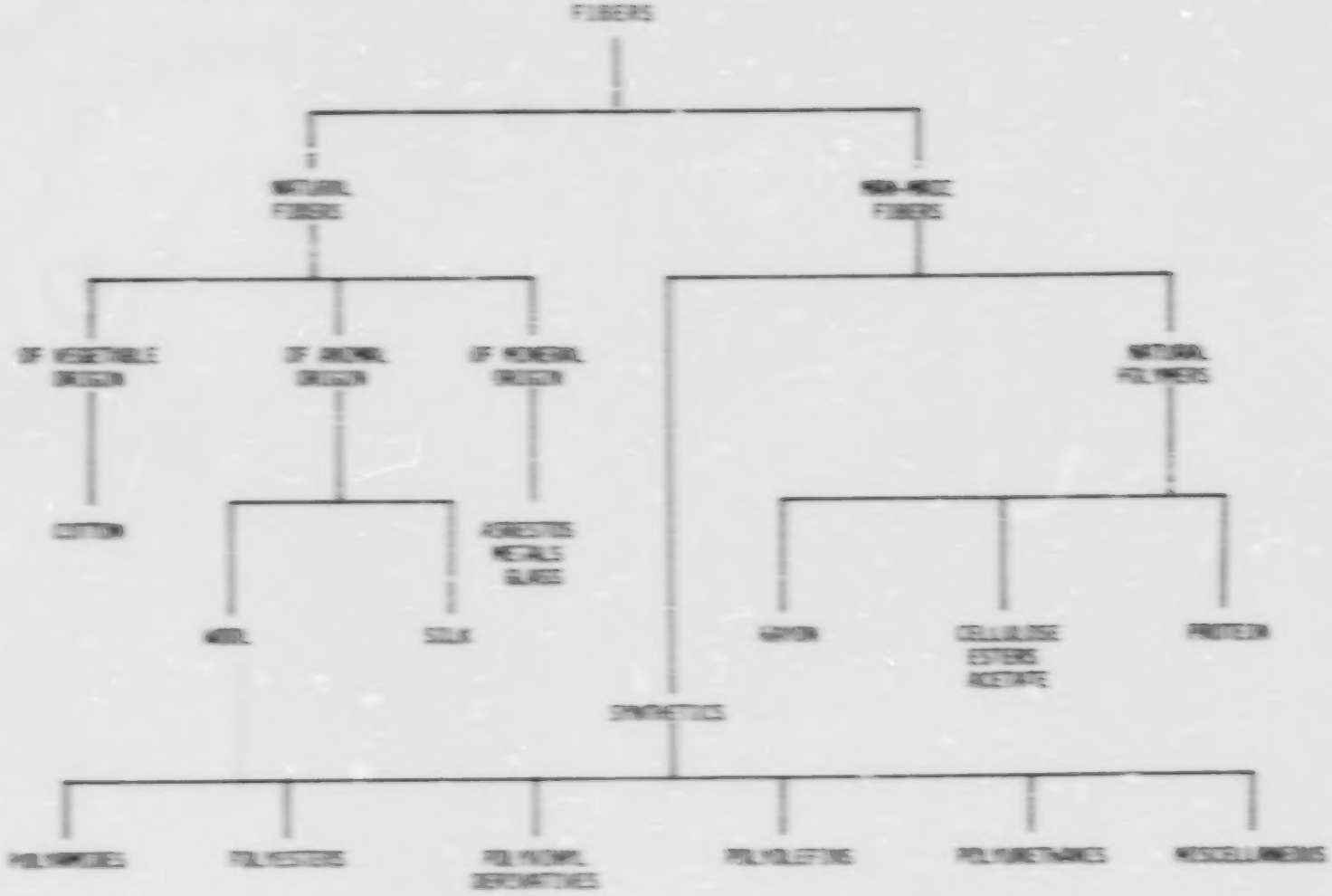

Figure 1. Fibers used in the textile industry.[1]

of the mineral fibers, generally follow three basic manufacturing procedures. These basic procedures are illustrated in Figure 2, which represents the general flow of materials through the textile industry, and includes: (a) converting fiber, filament, and tow into yarn; (b) converting yarn into fabric; and (c) converting fabric into finished fabric. The operations for each of these procedures were flow charted in Figures 3, 4, and 5 (A, B, and C) for man-made, vegetable, and animal fibers, respectively. For each fiber, individual flows of: (A) filament, fibers and tow to yarn; (b) yarn to fabric; and (C) fabric to finished fabric, are provided.

2. SIC Classifications of Operations

The flows of man-made, vegetable, and animal fibers in the textile industry (primary production routes) are represented in Figures 6, 7, and 8, respectively, for each of the SIC Codes listed in Table 5. Therefore, each SIC Code listed in Table 5 represents a group of operations in Figures 3, 4, and 5. For this reason, the textile industry was divided into air pollution source types by combining the SIC Codes (Table 5) with the operations given in Figures 3, 4, and 5. The resulting air pollution source types for these SIC Codes are listed in Tables 7 through 28.

C. STATE-BY-STATE AND NATIONAL LISTINGS

State-by-state and national listings refer to compilations of mass emissions of criteria pollutants by textile source type for specific states and for the nation. These data are computed through use of the prioritization forms shown in Figures 9 and 10. These forms were completed after an extensive study of the literature. Only literature data of "C" confidence level or higher (as defined in Reference 4) were used.

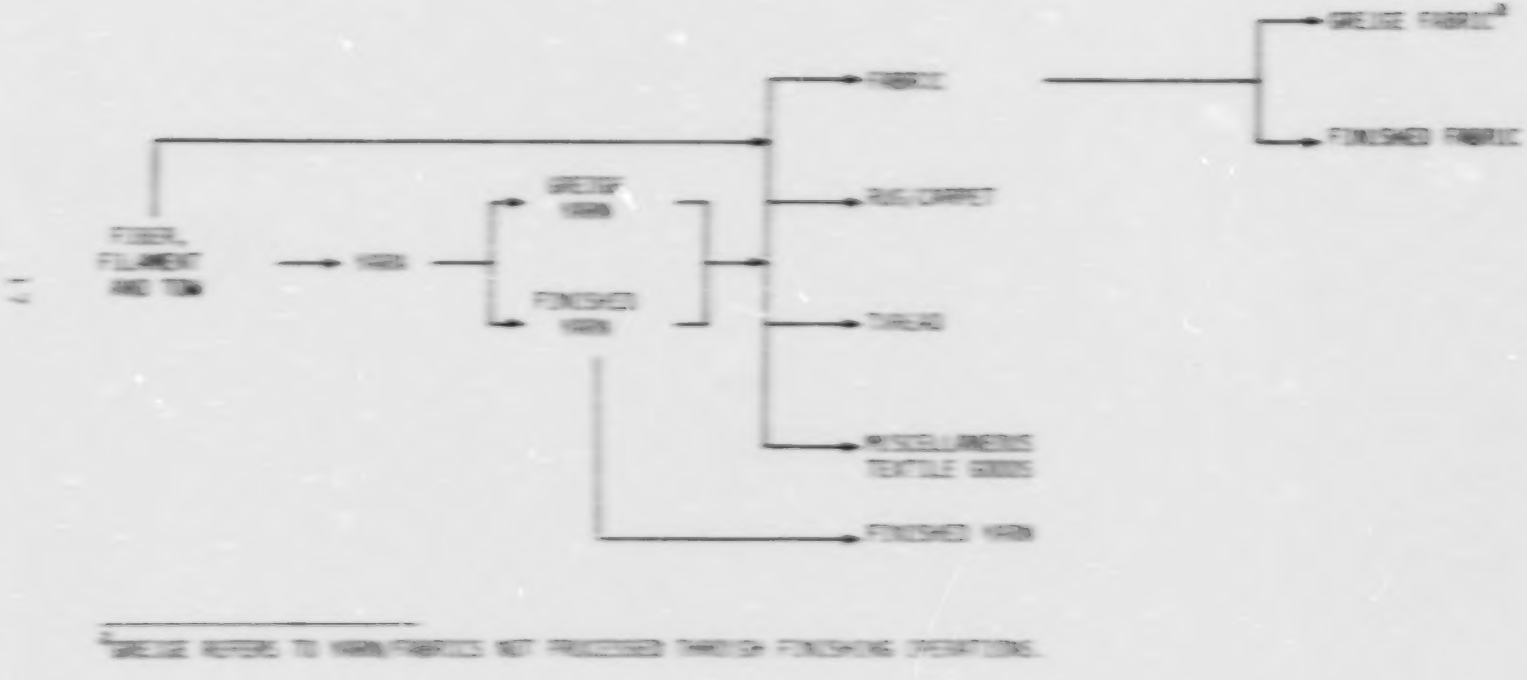

Figure 2. General flow diagram of manufacture in the textile industry.

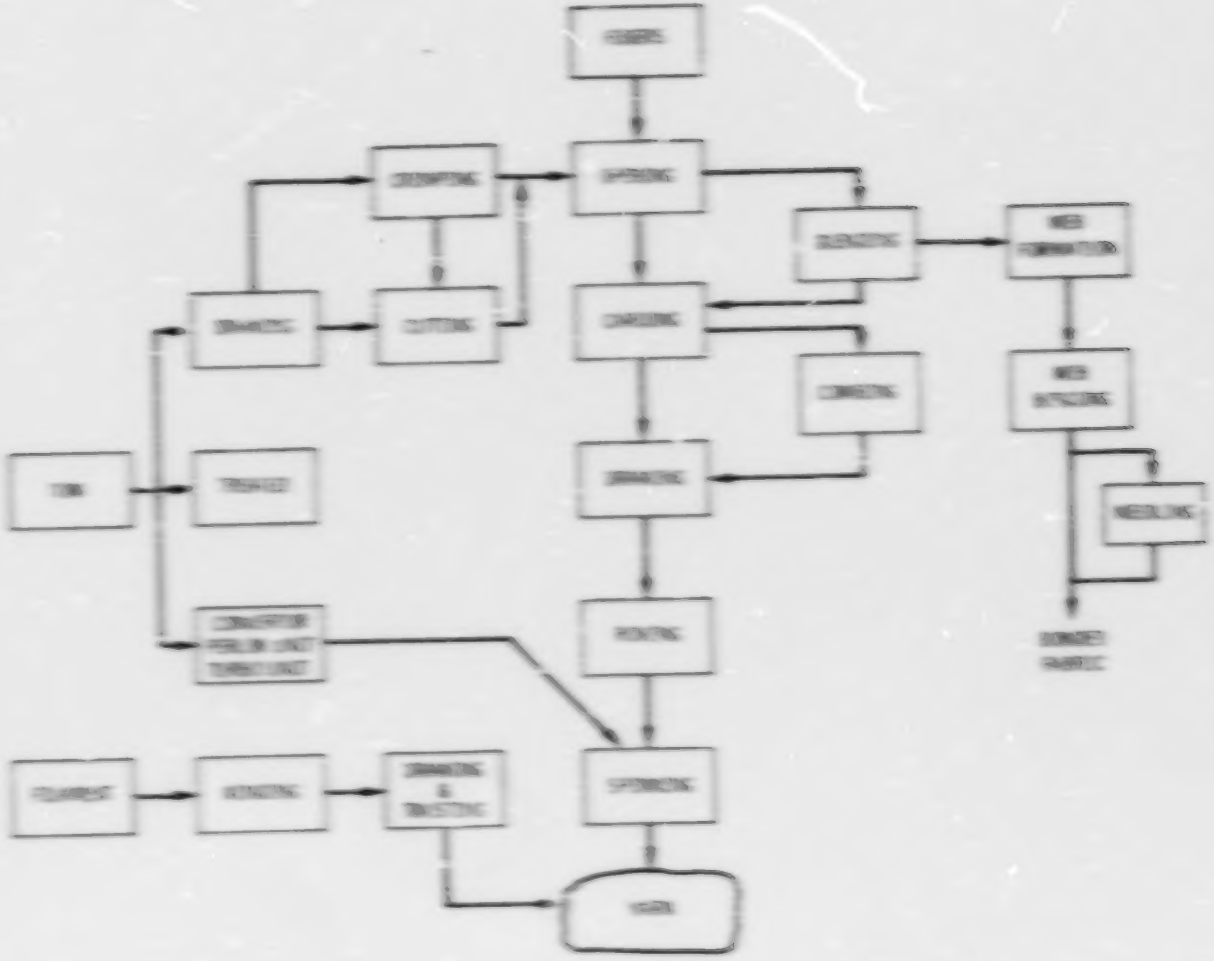

Figure 3A. Flowchart for man-made fiber--filament, fibers, and tow to yarn (including bonded fabrics).

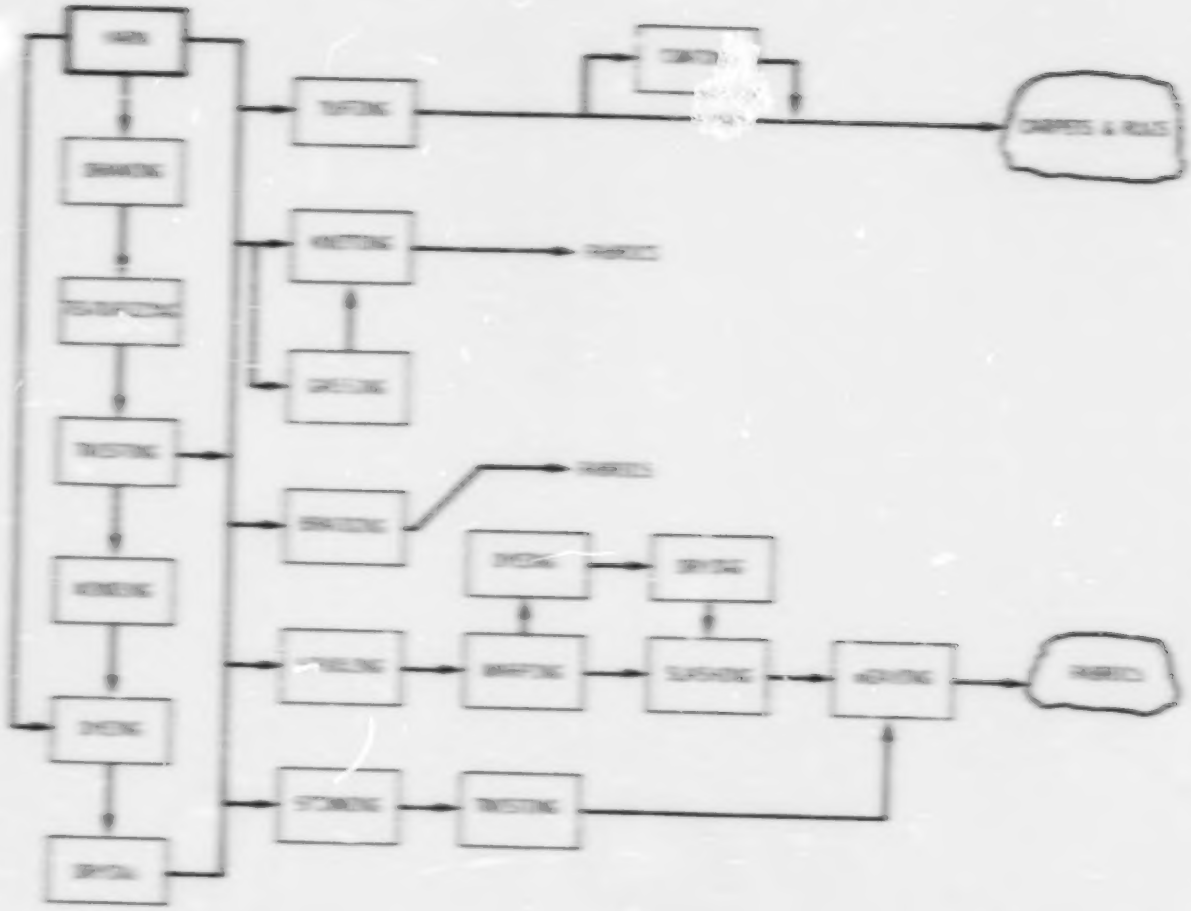

Figure 38. Flowchart for man-made fiber--yarn to fabric.

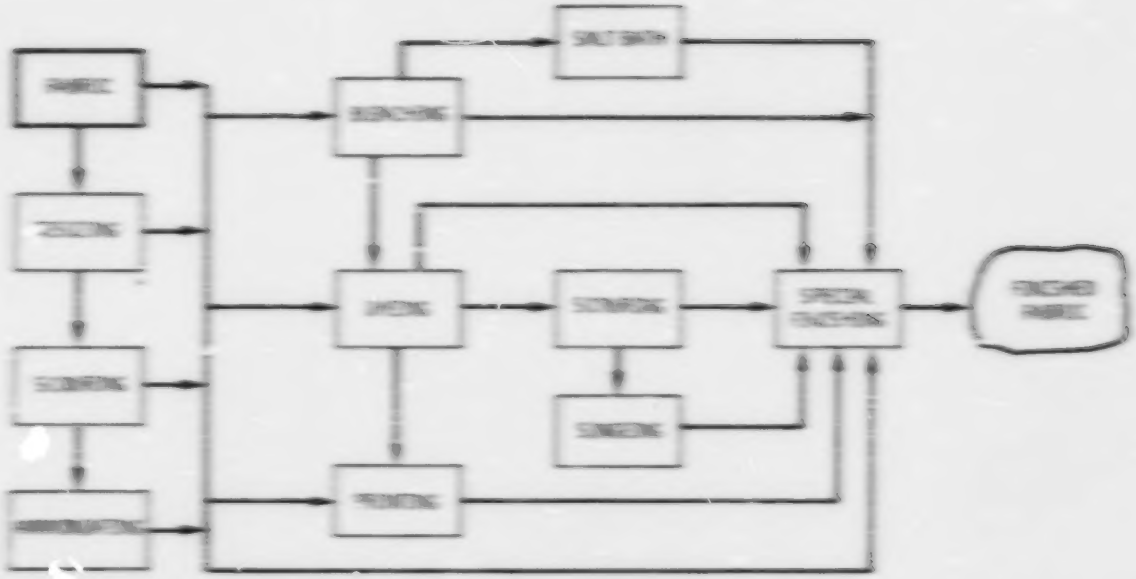

Figure 1. Flowchart for man-made fiber--fabric to finished fabric.

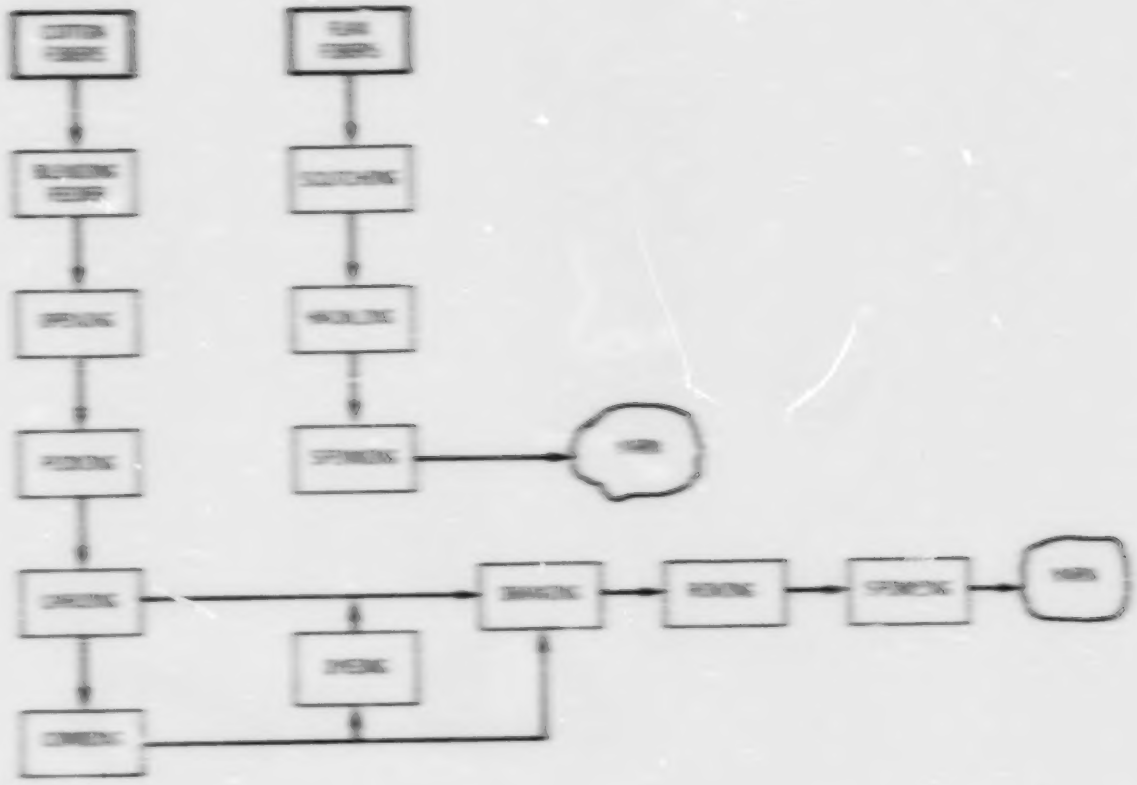

Figure 41. Flowchart for vegetable fibers (cotton)--fiber to yarn.

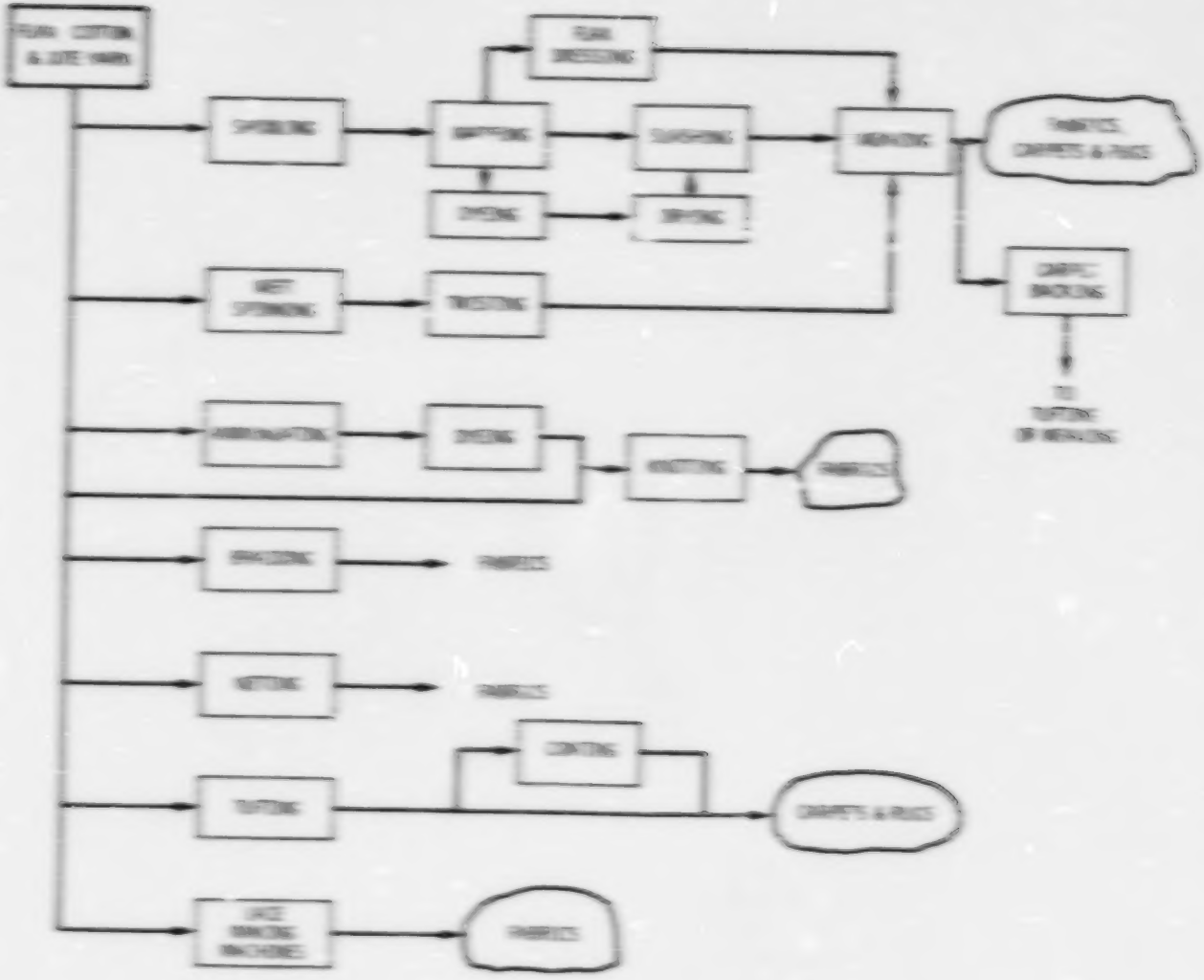

Figure 48. Flowchart for vegetable fibers (cotton)--yarn to fabric.

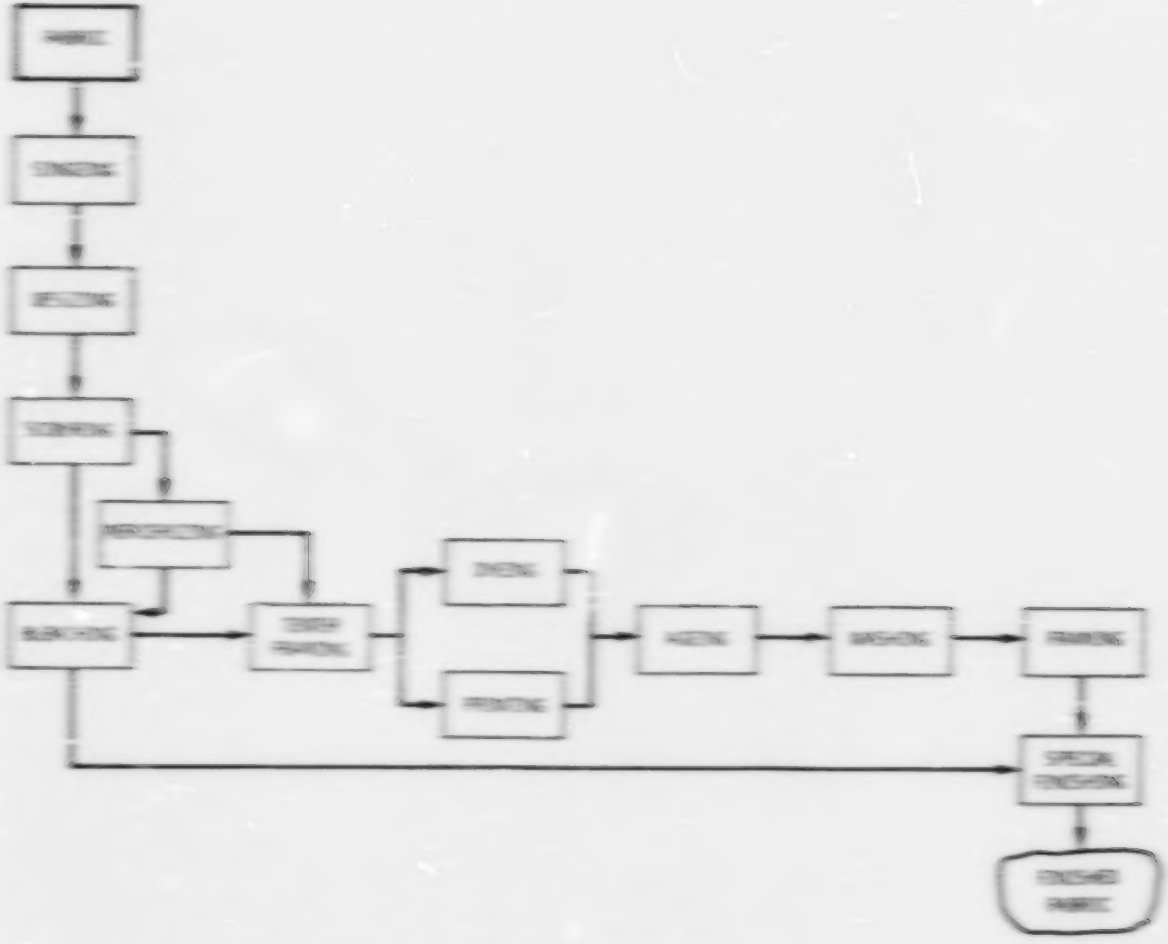

Figure 4C. Flowchart for vegetable fibers--fabric to finished fabric.

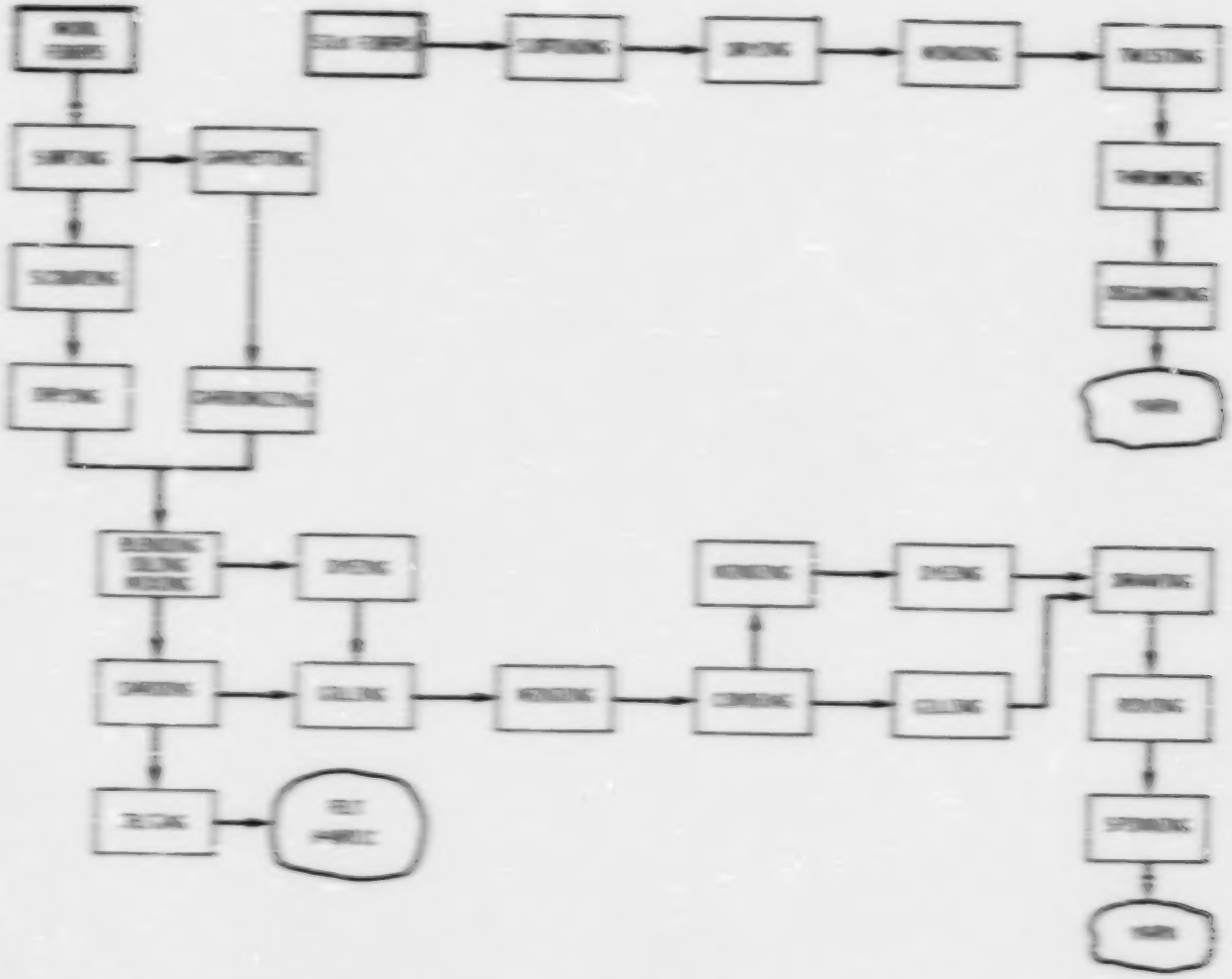

Figure 5A. Flowchart for animal fibers—fiber to yarn (including felt fabric).

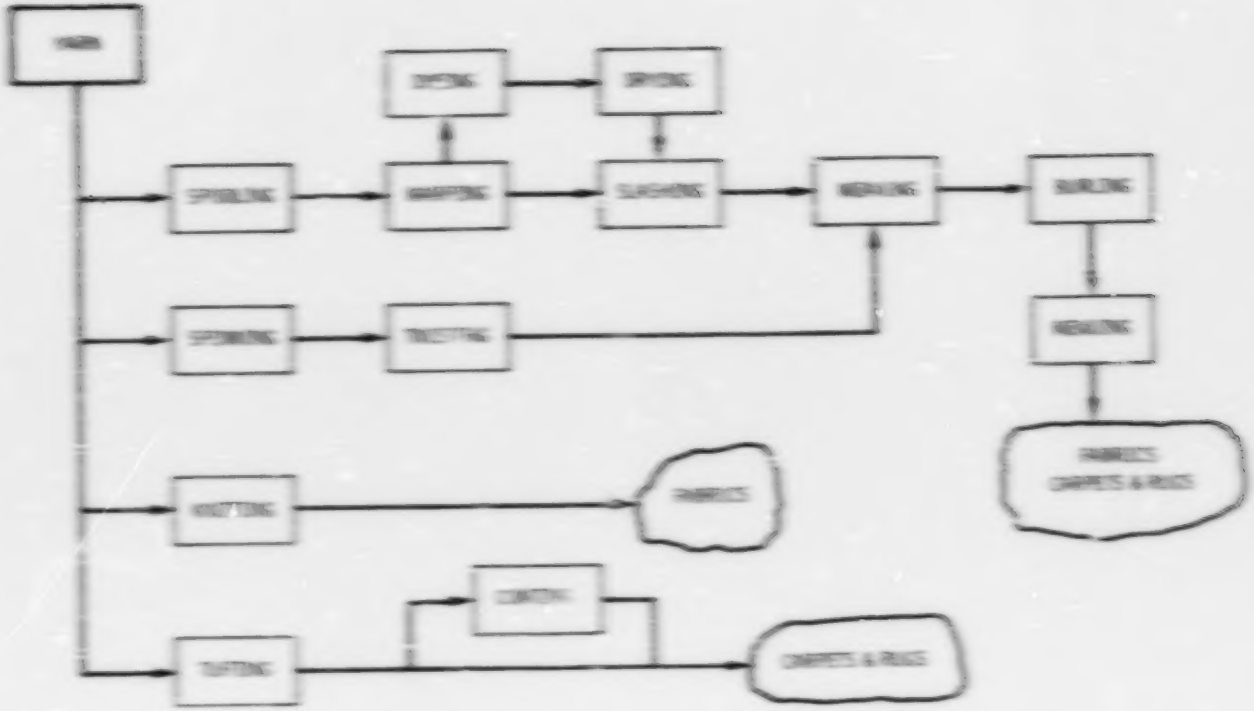

Figure 52. Flowchart for animal fibers--yarn to fabric.

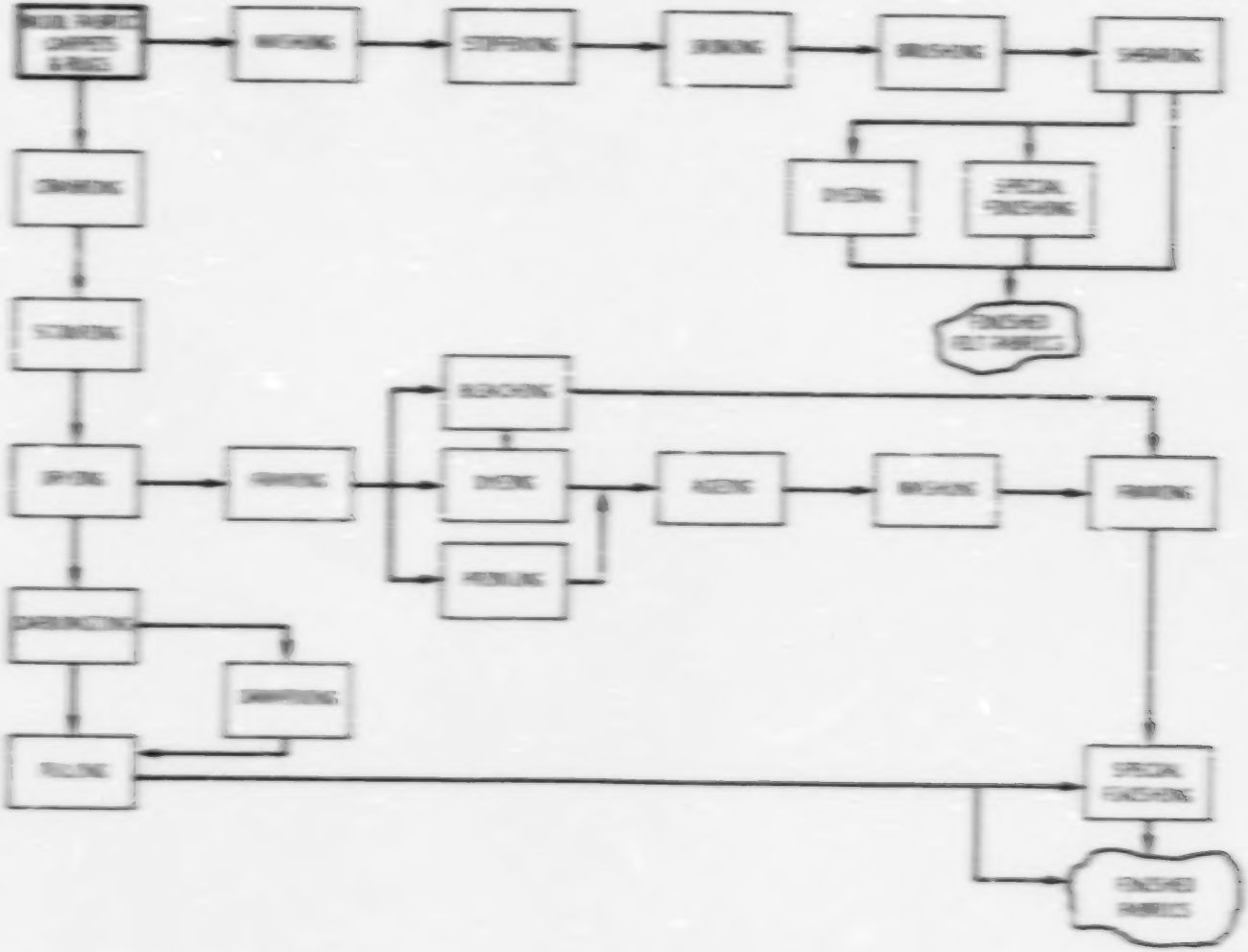

Figure 5C. Flowchart for animal fibers--fabric to finished fabric.

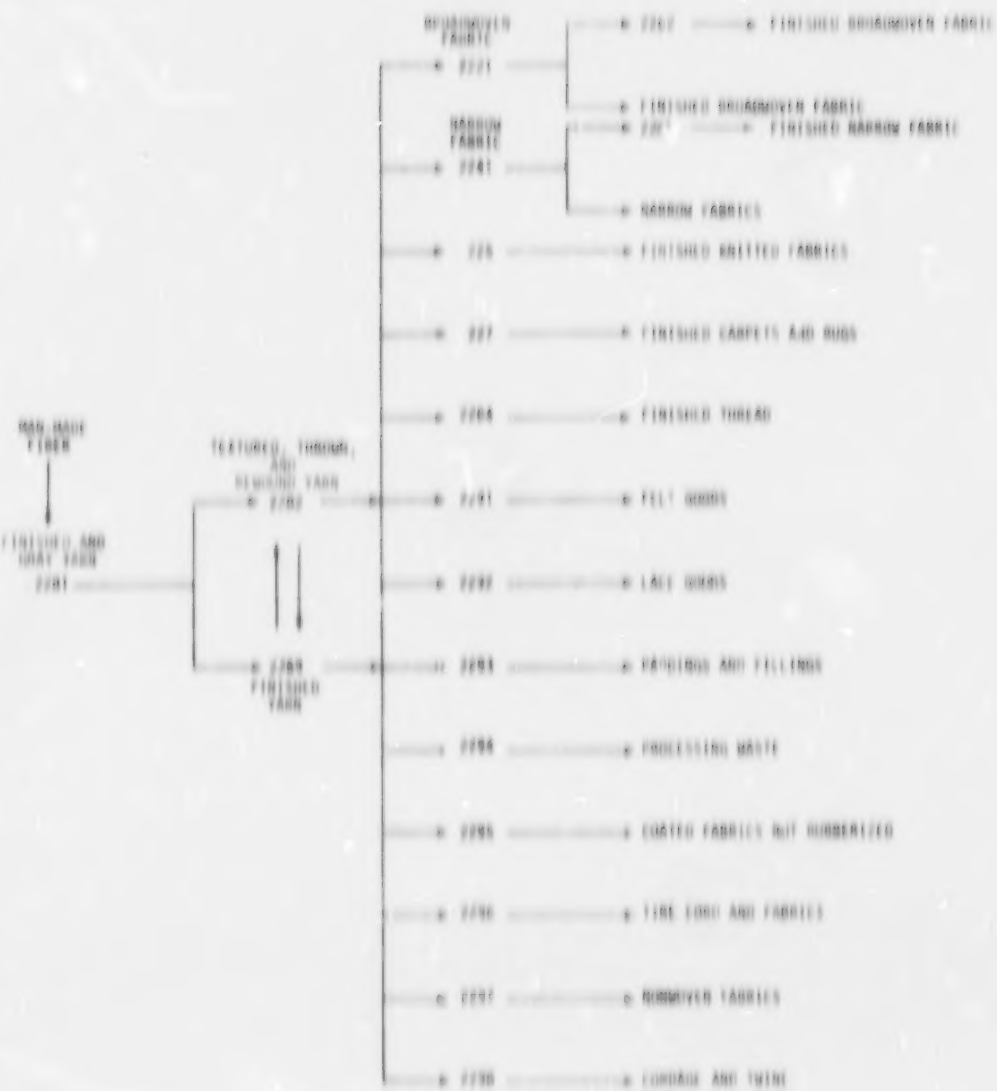

Figure 6. Primary products routes--man-made and silk fibers.

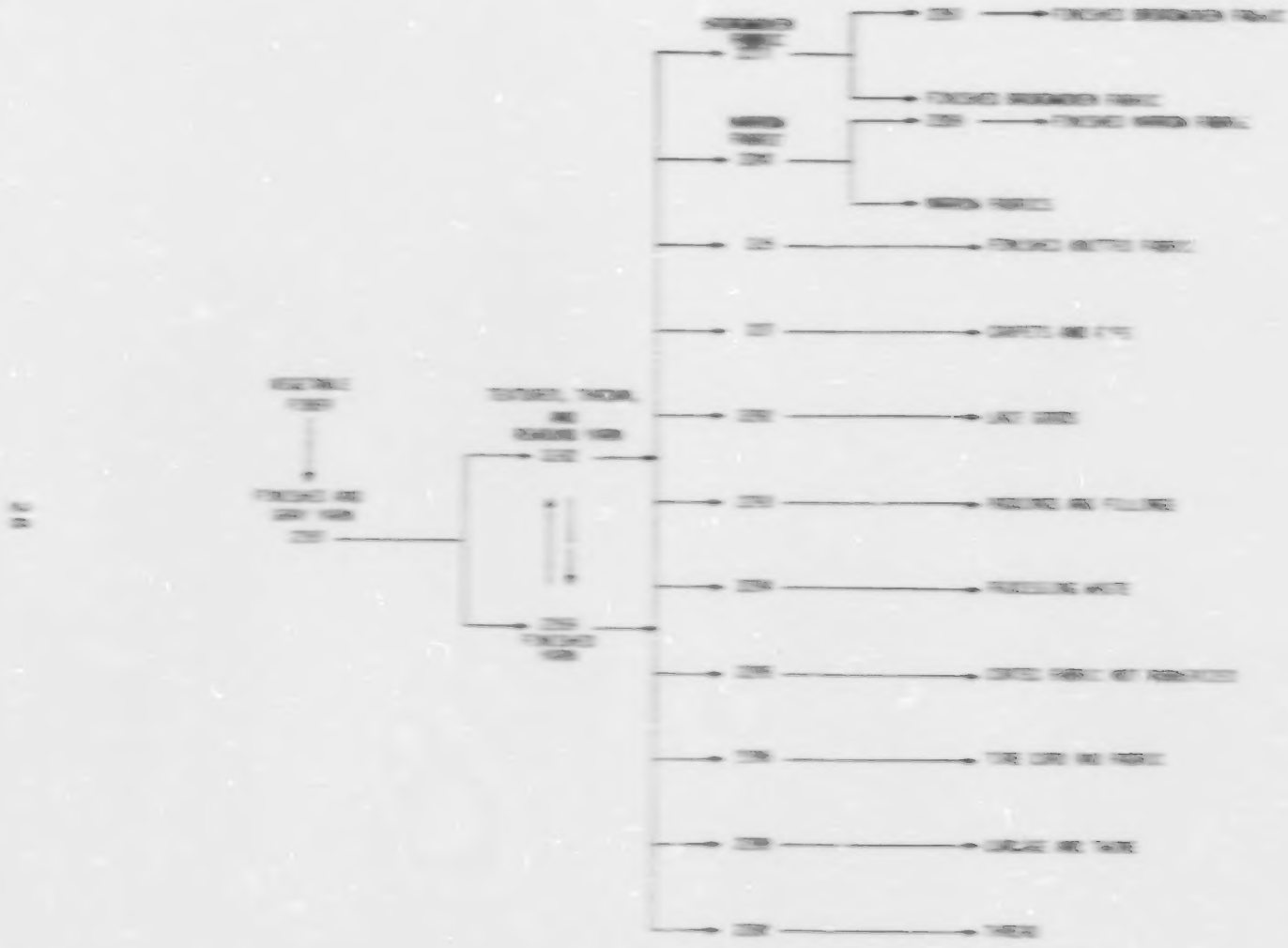

Figure 7. Primary products route--cotton and vegetable fibers.

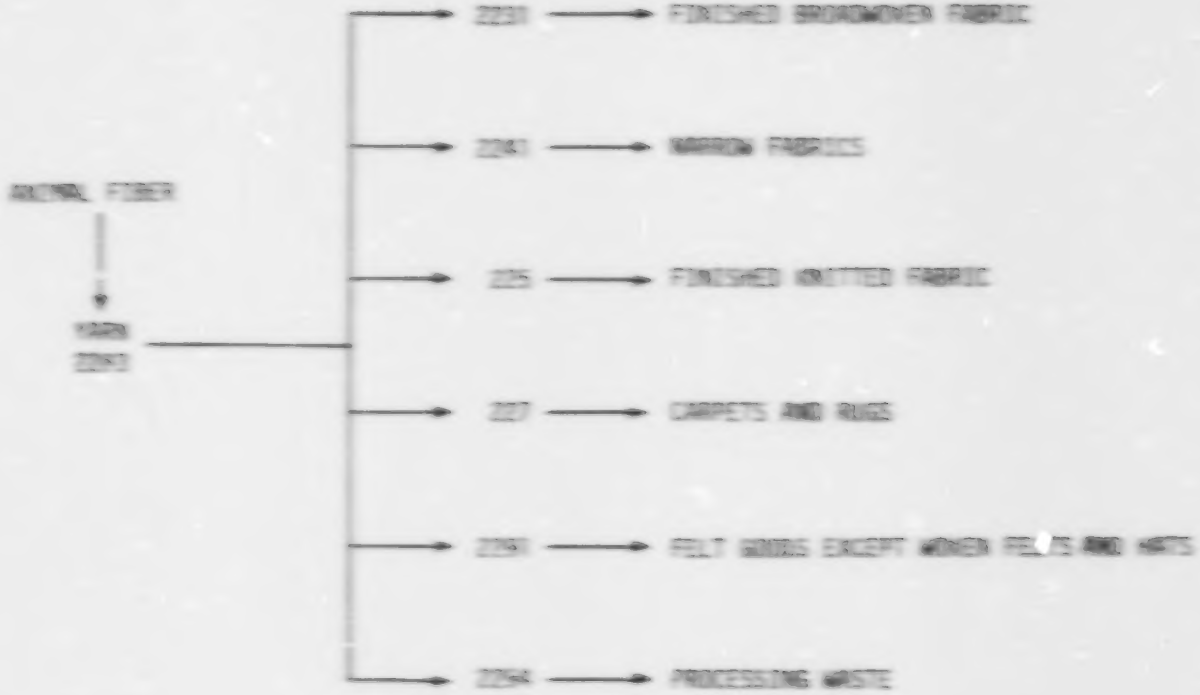

Figure 8. Primary products route--wool and animal fibers.

Table 7. AIR POLLUTION SOURCE TYPES IN TEXTILE MANUFACTURING--SIC CODE 2211, COTTON WEAVING MILLS[a]

1. Spooling cotton yarn
2. Warping cotton yarn
3. Slashing cotton yarn
4. Spinning cotton yarn
5. Twisting cotton yarn
6. Weaving cotton yearn
7. Dyeing cotton yarn[b]
8. Bleaching cotton yarn[b]
9. Singeing woven cotton fabric
10. Desizing woven cotton fabric[b]
11. Scouring woven cotton fabric[b]
12. Mercerizing woven cotton fabric[b]
13. Dyeing woven cotton fabric[b]
14. Printing woven cotton fabric[b]
15. Bleaching woven cotton fabric[b]
16. Special chemical finishing woven cotton fabric[b]
17. Mechanical finishing woven cotton fabric
18. Ammoniating cotton yarn[b]
19. Ammoniating woven cotton fabric[b]
20. Weaving cotton carpet and rug backing

[a]Includes cotton blends (≥50% cotton).

[b]Includes accompanying operations such as heat-set, rinses, drying, etc.

Table 8. AIR POLLUTION SOURCE TYPES IN TEXTILE MANUFACTURING--SIC CODE 2221, MAN-MADE FIBER AND SILK WEAVING MILLS

1. Spooling man-made yarn
2. Warping man-made yarn
3. Slashing man-made yarn
4. Weaving man-made yarn
5. Spinning man-made yarn

(continued)

Table 8 (continued).

6.	Twisting man-made yarn
7.	Dyeing man-made yarn[a]
8.	Bleaching man-made yarn[a]
9.	Desizing woven man-made fabric[a]
10.	Scouring woven man-made fabric[a]
11.	Singeing woven man-made fabric
12.	Ammoniating woven man-made fabric[a]
13.	Ammoniating man-made yarn[a]
14.	Bleaching woven man-made fabric[a]
15.	Dyeing woven man-made fabric[a]
16.	Printing woven man-made fabric[a]
17.	Special chemical finishing woven man-made fabric[a]
18.	Mechanical finishing woven man-made fabric[a]
19.	Weaving man-made carpet and rug backing

[a]Includes accompanying operations such as heat-set, rinses, drying, etc.

Table 9. AIR POLLUTION SOURCE TYPES IN TEXTILE MANUFACTURING--SIC CODE 2231, WOOL WEAVING AND FINISHING MILLS

1.	Fulling woven wool fabric[a]
2.	Crabbing woven wool fabric[a]
3.	Bleaching wool yarn[a]
4.	Bleaching woven wool fabric[a]
5.	Dyeing wool yarn[a]
6.	Dyeing woven wool fabric[a]
7.	Printing woven wool fabric[a]
8.	Special chemical finishing wool fabric[a]
9.	Mechanical finishing wool fabric

[a]Includes accompanying operations such as heat-set, rinses, drying, etc.

TABLE 10. AIR POLLUTION SOURCE TYPES IN TEXTILE MANUFACTURING--SIC CODE 2241, NARROW FABRIC MILLS

1.	Spooling cotton yarn
2.	Spooling wool yarn
3.	Spooling man-made yarn
4.	Warping cotton yarn
5.	Warping wool yarn
6.	Warping man-made yarn
7.	Slashing cotton yarn
8.	Slashing wool yarn
9.	Slashing man-made yarn
10.	Weaving cotton yarn
11.	Weaving wool yarn
12.	Weaving man-made yarn
13.	Spinning cotton yarn
14.	Spinning wool yarn
15.	Spinning man-made yarn
16.	Twisting cotton yarn
17.	Twisting wool yarn
18.	Twisting man-made yarn
19.	Braiding cotton yarn
20.	Braiding wool yarn
21.	Braiding man-made yarn
22.	Manufacturing rubber-covered thread

TABLE 11. AIR POLLUTION SOURCE TYPES IN TEXTILE MANUFACTURING--SIC CODE 225, KNITTING MILLS

1.	Knitting cotton yarn[a]
2.	Knitting wool yarn[a]
3.	Knitting man-made yarn[a]
4.	Dyeing knitted cotton fabric[b]
5.	Bleaching knitted cotton fabric[b]

(continued)

Table 11 (continued).

6.	Printing knitted cotton fabric[b]
7.	Special chemical finishing knitted cotton fabric[b]
8.	Mechanical finishing knitted cotton fabric
9.	Singeing knitted cotton fabric
10.	Mercerising knitted cotton fabric[b]
11.	Scouring knitted cotton fabric[b]
12.	Ammonisting knitted cotton fabric[b]
13.	Dyeing cotton yarn[b]
14.	Bleaching cotton yarn[b]
15.	Gassing cotton yarn
16.	Ammoniating cotton yarn[b]
17.	Bleaching knitted wool fabric[b]
18.	Printing knitted wool fabric[b]
19.	Dyeing knitted wool fabric[b]
20.	Special chemical finishing knitted wool fabric[b]
21.	Mechanical finishing knitted wool fabric
22.	Fulling knitted wool fabric[b]
23.	Crabbing knitted wool fabric[b]
24.	Dyeing wool yarn[b]
25.	Bleaching wool yarn[b]
26.	Dyeing knitted man-made fabric[b]
27.	Bleaching knitted man-made fabric[b]
28.	Printing knitted man-made fabric[b]
29.	Special chemical finishing knitted man-made fabric[b]
30.	Mechanical finishing knitted man-made fabric
31.	Scouring knitted man-made fabric[b]
32.	Ammoniating knitted man-made fabric[b]
33.	Dyeing man-made yarn[b]
34.	Bleaching man-made yarn[b]
35.	Ammoniating man-made yarn[b]
36.	Singeing knitted man-made fabric

[a] Includes all types of knitting operations such as jacquard, circular, flat, etc.

[b] Includes accompanying operations such as heat-set, rinses, drying, etc.

Table 12. AIR POLLUTION SOURCE TYPES IN TEXTILE MANUFACTURING--SIC CODE 2261, COTTON FINISHING PLANTS[a]

1. Singeing woven cotton fabric
2. Scouring woven cotton fabric[b]
3. Mercerising woven cotton fabric[b]
4. Dyeing woven cotton fabric[b]
5. Printing woven cotton fabric[b]
6. Bleaching woven cotton fabric[b]
7. Special chemical finishing woven cotton fabric[b]
8. Mechanical finishing woven cotton fabric
9. Ammoniating woven cotton fabric[b]
10. Desizing woven cotton fabric[b]

[a] Includes cotton blends (≥50% cotton).

[b] Includes accompanying operations such as heat-set, rinses, drying, etc.

Table 13. AIR POLLUTION SOURCE TYPES IN TEXTILE MANUFACTURING--SIC CODE 2262, MAN-MADE FIBER AND SILK FINISHING PLANTS[a]

1. Desizing woven man-made fabric[b]
2. Scouring woven man-made fabric[b]
3. Singeing woven man-made fabric
4. Ammoniating woven man-made fabric[b]
5. Bleaching woven man-made fabric[b]
6. Dyeing woven man-made fabric[b]
7. Printing woven man-made fabric[b]
8. Special chemical finishing woven man-made fabric[b]
9. Mechanical finishing woven man-made fabric
10. Dyeing man-made yarn[b]
11. Ammoniating man-made yarn[b]
12. Bleaching man-made yarn[b]

[a] Includes natural/man-made blends ≥50% man-made.

[b] Includes accompanying operations such as heat-set, rinses, drying, etc.

Table 14. AIR POLLUTION SOURCE TYPES IN TEXTILE MANUFACTURING--SIC CODE 2269, FINISHING PLANTS, N.E.C.

1. Bleaching cotton yarn[a]
2. Bleaching woven cotton fabric[a]
3. Bleaching braided cotton fabric[a]
4. Printing woven cotton fabric[a]
5. Printing braided cotton fabric[a]
6. Dyeing cotton yarn[a]
7. Dyeing woven cotton fabric[a]
8. Dyeing braided cotton fabric[a]
9. Bleaching man-made yarn[a]
10. Dyeing man-made yarn[a]
11. Bleaching woven man-made fabric[a]
12. Bleaching braided man-made fabric[a]
13. Printing woven man-made fabric[a]
14. Printing braided man-made fabric[a]
15. Special chemical finishing woven cotton fabric[a]
16. Special chemical finishing woven man-made fabric[a]
17. Mechanical finishing woven cotton fabric
18. Mechanical finishing woven man-made fabric
19. Special chemical finishing braided cotton fabric[a]
20. Special chemical finishing braided man-made fabric[a]
21. Singeing woven cotton fabric
22. Mechanical finishing braided cotton fabric
23. Mechanical finishing braided man-made fabric
24. Singeing man-made woven fabric
25. Mercerizing woven cotton fabric[a]
26. Scouring woven cotton fabric[a]
27. Ammoniating woven cotton fabric[a]
28. Gassing cotton yarn
29. Ammoniating cotton yarn[a]
30. Ammoniating man-made yarn[a]
31. Ammoniating woven man-made fabric[a]
32. Desizing woven cotton fabric[a]

(continued)

Table 14 (continued).

13.	Desizing woven man-made fabric[a]
14.	Desizing woven wool fabric[a]
15.	Scouring woven man-made fabric[a]
16.	Dyeing man-made yarn[a]
17.	Dyeing woven man-made fabric[a]
18.	Dyeing braided man-made fabric[a]
19.	Dyeing cotton fibers[a]
40.	Dyeing man-made fibers[a]
41.	Bleaching cotton fibers[a]
42.	Bleaching man-made fibers[a]

[a]Includes accompanying operations such as heat-set, rinses, drying, etc.

Table 15. AIR POLLUTION SOURCE TYPES IN TEXTILE MANUFACTURING--SIC CODE 227, FLOOR COVERING MILLS

1.	Tufting cotton rugs and carpets
2.	Tufting wool rugs and carpets
3.	Tufting man-made rugs and carpets
4.	Printing cotton rugs and carpets[a]
5.	Printing wool rugs and carpets[a]
6.	Printing man-made rugs and carpets[a]
7.	Coating tufted cotton rugs and carpets[a]
8.	Coating tufted wool rugs and carpets[a]
9.	Coating tufted man-made rugs and carpets[a]
10.	Weaving cotton rugs and carpets
11.	Weaving wool rugs and carpets
12.	Weaving man-made rugs and carpets
13.	Printing cotton warp-rugs and carpets[a]
14.	Printing wool warp-rugs and carpets[a]
15.	Printing man-made warp-rugs and carpets[a]
16.	Dyeing cotton rugs and carpets[a]
17.	Dyeing wool rugs and carpets[a]

(continued)

Table 15 (continued).

18.	Dyeing man-made rugs and carpets[a]
19.	Manufacturing miscellaneous rugs and carpets
20.	Special chemical finishing wool rugs and carpets[a]
21.	Special chemical finishing cotton rugs and carpets[a]
22.	Special chemical finishing man-made rugs and carpets[a]
23.	Mechanical finishing cotton rugs and carpets
24.	Mechanical finishing wool rugs and carpets
25.	Mechanical finishing man-made rugs and carpets

[a]Includes accompanying operations such as heat-set, drying, rinses, etc.

Table 16. AIR POLLUTION SOURCE TYPES IN TEXTILE MANUFACTURING--SIC CODE 2281, YARN MILLS EXCEPT WOOL

1.	Drawing man-made filaments
2.	Crimping man-made filaments
3.	Treating man-made tow
4.	Cutting man-made filaments
5.	Opening man-made staple fibers
6.	Converting man-made tow
7.	Blending man-made fibers
8.	Carding man-made fibers
9.	Combing man-made fibers
10.	Drawing man-made fibers
11.	Roving man-made fibers
12.	Spinning man-made fibers
13.	Opening cotton fibers
14.	Blending cotton fibers
15.	Carding cotton fibers
16.	Combing cotton fibers
17.	Drawing cotton fibers
18.	Roving cotton fibers
19.	Spinning cotton fibers

(continued)

Table 16 (continued).

20. Dyeing cotton fibers
21. Dyeing man-made fibers
22. Bleaching cotton fibers
23. Bleaching man-made fibers

Table 17. AIR POLLUTION SOURCE TYPES IN TEXTILE MANUFACTURING--SIC CODE 2282, THROWING AND WINDING MILLS

1. Texturizing man-made filaments
2. Throwing man-made filaments
3. Twisting man-made filaments
4. Winding man-made filaments
5. Spooling man-made filaments
6. Throwing cotton yarn
7. Twisting cotton yarn
8. Winding cotton yarn
9. Spooling cotton yarn
10. Drawing man-made filaments
11. Chemically-treating cotton yarn
12. Slack mercerizing cotton yarn

Table 18. AIR POLLUTION SOURCE TYPES IN TEXTILE MANUFACTURING--SIC CODE 2281, WOOL YARN MILLS

1. Spinning wool yarn
2. Twisting wool yarn
3. Winding wool yarn
4. Spooling wool yarn
5. Sorting wool fibers
6. Scouring wool fibers
7. Carbonizing wool fibers
8. Dyeing wool yarn
9. Bleaching wool yarn

(continued)

Table 18 (continued).

10.	Bleaching wool fibers
11.	Dyeing wool fibers
12.	Gilling wool fibers
13.	Combing wool fibers
14.	Carding wool fibers
15.	Blending wool fibers
16.	Drawing wool fibers
17.	Roving wool fibers
18.	Spinning wool fibers
19.	Oiling wool fibers

Table 19. AIR POLLUTION SOURCE TYPES IN TEXTILE MANUFACTURING--SIC CODE 2284, THREAD MILLS

1.	Manufacturing man-made thread
2.	Manufacturing cotton thread
3.	Manufacturing wool thread

Table 20. AIR POLLUTION SOURCE TYPES IN TEXTILE MANUFACTURING--SIC CODE 2291, FELT GOODS EXCEPT WOVEN FELTS AND HATS

1.	Felting wool fibers
2.	Carding wool fibers
3.	Scouring wool fibers[a]
4.	Carbonizing wool fibers[a]
5.	Blending wool fibers
6.	Dampening wool fibers[a]
7.	Fulling wool fibers[a]
8.	Washing wool fibers[a]
9.	Stiffening felt fabric[a]
10.	Dyeing felt fabric[a]
11.	Ironing felt fabric

(continued)

Table 20 (continued).

12.	Brushing felt fabric
13.	Shearing felt fabric
14.	Special chemical finishing felt fabric[a]

[a]Includes accompanying operations such as heat-set, rinses, drying, etc.

Table 21. AIR POLLUTION SOURCE TYPES IN TEXTILE MANUFACTURING--SIC CODE 2292.

1.	Gassing cotton yarn
2.	Dyeing lace fabric[a]
3.	Bleaching lace fabric[a]
4.	Printing lace fabric[a]
5.	Mechanical finishing lace fabric
6.	Special chemical finishing lace fabric[a]
7.	Lacemaking

[a]Includes accompanying operations such as heat-set, rinses, drying, etc.

Table 22. AIR POLLUTION SOURCE TYPES IN TEXTILE MANUFACTURING--SIC CODE 2293, PADDINGS AND UPHOLSTERY FILLING

1.	Paddings and filling manufacture

Table 23. AIR POLLUTION SOURCE TYPES IN TEXTILE MANUFACTURING--SIC CODE 2294, PROCESSED TEXTILE WASTE

1.	Garnetting wool fibers
2.	Manufacturing oakum and jute packing
3.	Recovering textile fibers
4.	Processing textile waste

Table 24. AIR POLLUTION SOURCE TYPES IN TEXTILE MANUFACTURING--SIC CODE 2295, COATED FABRICS NOT RUBBERIZED

1.	Manufacturing coated and impregnated textiles[a]
2.	Special chemical finishing--coated fabrics[a]
3.	Mechanical finishing--coated fabric

[a]Includes accompanying operations such as drying, rinses, heat-set, etc.

Table 25. AIR POLLUTION SOURCE TYPES IN TEXTILE MANUFACTURING--SIC CODE 2296, TIRE CORD AND FABRIC

1.	Manufacturing tire cord and fabric

Table 26. AIR POLLUTION SOURCE TYPES IN TEXTILE MANUFACTURING--SIC CODE 2297, NONWOVEN FABRICS

1.	Web formation--nonwovens
2.	Man-made fiber opening
3.	Man-made fiber blending
4.	Web bonding--nonwovens
5.	Needling--nonwovens

Table 27. AIR POLLUTION SOURCE TYPES IN TEXTILE MANUFACTURING--SIC CODE 2298, CORDAGE AND TWINE

1.	Manufacturing cordage and twine

Table 28. AIR POLLUTION SOURCE TYPES IN TEXTILE MANUFACTURING--SIC CODE 2299, MISCELLANEOUS TEXTILE GOODS

1.	Bleaching linen fabric[a]
2.	Weaving jute backing
3.	Manufacturing linen goods
4.	Breaking and scutching flax fibers

(continued)

Table 28 (continued).

5.	Hackling flax fibers
6.	Spinning flax fibers
7.	Dyeing linen fabric[a]
8.	Printing linen fabric[a]
9.	Manufacturing textile goods, N.E.C.
10.	Processing textile fibers
11.	Special chemical finishing linen fabric[a]
12.	Mechanical finishing linen fabric

[a] Includes accompanying operations such as heat-set, drying, rinses, etc.

EP-2 LOCATION SENSITIVE PRIORITIZATION DATA Log No: _____

Confidence Level _____

CATEGORY _____

SOURCE DESCRIPTION _____

SCC _____

TOTAL PRODUCTION _____ (TONS/YEAR)

FREQUENCY OF OPERATION _____ (% OF YEAR)

NUMBER OF PLANTS/SITES _____

NUMBER OF MATERIALS EMITTED _____

MATERIAL EMITTED	TLV ($\mu g/m^3$)	EMISSION FACTOR (lbs/ton)	AVG. EMISSION RATE(S)	REFERENCE
PARTICULATE				
SOX				
NOX				
HC				
CO				

Figure 9. Prioritization form used for state-by-state and national listings.

EF:3A

LOCATION POSSIBLE EQUIPMENTIZATION DATA
STATE INFORMATION

SOURCE DESCRIPTION_____

AVERAGE PLANT SIZE_____ (TONS/YEAR)

NUMBER OF STATES_____

STATE CODE (XX)	STATE PRODUCTION (TONS/YEAR)	NUMBER OF PLANTS	REFERENCE

To obtain the total mass emissions of a specific criteria pollutant in a particular state, the emission factor for the pollutant was multiplied by the annual production rate in the state. Similarly, the total mass emissions of a criteria pollutant in the nation was obtained by multiplying the emission factor for the pollutant by the annual total production in the U.S.

The state-by-state listing of emissions of criteria pollutants from textile manufacturing sources is shown throughout Table 29. In each state, for each source and criteria pollutant, the first number in each criteria pollutant column is the annual mass emissions. For example, the source entitled "Breaking and Scutching Flax Fibers" emits 1.5×10^3 kg/yr of particulates in Alabama. The second number in each criteria pollutant column refers to the percentage that the annual mass emissions represents in relation to emissions of that pollutant from all textile sources in that state. For that same source type, "Breaking and Scutching Flax Fibers," 1.5×10^3 kg/yr represents 0.065% of all particulates emitted from textile manufacturing sources in Alabama.

A review of Table 29 indicates that emissions of criteria pollutants from textile operations are confined to a few sources. In most states, cotton handling activities were responsible for 95+% of the particulate matter generated from textile industries. Synthetic polymer particulates normally amounted to 5% to 10% of the total. However, in New Jersey over two-thirds of the particulates from textile sources were associated with synthetic polymer operations. In Illinois, Wisconsin, Vermont, Maine, and Oregon 50% to 100% of the textile particulates could be attributed to wool operations. Asbestos and flax emissions were the sole textile particulates emitted in Missouri and Louisiana.

Table 7A. STATE-BY-STATE LISTING OF CRITERIA POLLUTANT EMISSIONS FROM TEXTILE MANUFACTURING SOURCES

[illegible]

State	PART	SO2	NOX	HC	CO	P
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table 29 (continued).

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table 29 (continued).

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table 29 (continued).

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

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Table 29 (continued).

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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

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Table 29 (continued).

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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

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Table 29 (continued).

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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table 29 (continued).

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table 29 (continued).

Table 29 (continued).

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Table 29 (continued).

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Table 29 (continued).

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STATE PASSIVE RIVER FOR 1 CAPILLIN

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Table 29 (continued).

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table 29 (continued).

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table 25 (continued).

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Table 29 (continued).

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table 29 (continued).

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

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Table 25 (continued).

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

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Table 29 (continued).

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Textile printing operations are the source of most of the hydrocarbon emissions from textile manufacturing in all the states except Indiana, Oklahoma, Texas, and California. In these states, carpet dyeing operations account for the hydrocarbon emissions. Approximately two-thirds of the hydrocarbons from textile printing operations in half the states are attributed to the printing of cotton. The largest textile manufacturing states, Georgia, South Carolina, and North Carolina, in addition to Kentucky, Wisconsin, and Arkansas, generate 60+% of the state textile hydrocarbon emissions from the printing of rayon and natural polymers. Mississippi, California, Missouri, Ohio, and Maine have large hydrocarbon levels from silk and linen printing. The New England states have significant hydrocarbon levels from wool printing operations.

Mass emissions of nitrogen oxide, sulfur oxide, and carbon monoxide are minor from textile processing operations. They are primarily a result of the singeing of cotton and linen.

A state totals list, shown in Table 10, was generated to show the total mass emissions from all textile sources per state and the percentage that their emissions represent with respect to all textile sources in the nation. For example, the state of Alabama emits $2,152 \times 10^3$ kg/yr of particulates from all textile sources. This amount accounts for 6.74% of the particulate emissions from all textile sources in the nation as shown in the second entry under particulates for Alabama.

Textile manufacturing in eight states (Georgia, Massachusetts, New Jersey, New York, North Carolina, Pennsylvania, Rhode Island, and South Carolina) accounts for 87% of the total hydrocarbon emissions and 70% of the total particulate. Nitrogen oxide, sulfur oxide, and carbon monoxide mass levels are

Table 10. TOTAL CRITERIA POLLUTANT EMISSIONS FROM TEXTILE MANUFACTURING SOURCES IN EACH STATE

STATE CODE	STATE	PART	SO2	NOX	VOC	CO
1	ALABAMA	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]
2	ALASKA	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]
3	ARIZONA	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]
5	ARKANSAS	0.[illegible]	1.[illegible]	1.[illegible]	0.[illegible]	1.[illegible]
6	CALIFORNIA	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]
8	COLORADO	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]
9	CONNECTICUT	0.[illegible]	0.[illegible]	0.[illegible]	1.[illegible]	0.[illegible]
10	DELAWARE	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]
12	FLORIDA	0.[illegible]	0.[illegible]	0.[illegible]	1.[illegible]	0.[illegible]
13	GEORGIA	10.[illegible]	10.[illegible]	10.[illegible]	0.[illegible]	10.[illegible]
15	HAWAII	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]
16	IDAHO	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]
17	ILLINOIS	1.[illegible]	1.[illegible]	1.[illegible]	0.[illegible]	1.[illegible]
18	INDIANA	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]
19	IOWA	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]
20	KANSAS	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]
21	KENTUCKY	1.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]
22	LOUISIANA	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]
23	MAINE	2.[illegible]	0.[illegible]	0.[illegible]	1.[illegible]	0.[illegible]
24	MARYLAND	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]
25	MASSACHUSETTS	1.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]

Table 30 (continued).

26 MICHIGAN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
27 MINNESOTA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
28 MISSISSIPPI	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
29 MISSOURI	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
30 MONTANA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
31 NEBRASKA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
32 NEVADA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
33 NEW HAMPSHIRE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
34 NEW JERSEY	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
35 NEW MEXICO	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
36 NEW YORK	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
37 N CAROLINA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
38 N DAKOTA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
39 OHIO	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
40 OKLAHOMA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
41 OREGON	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
42 PENNSYLVANIA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
44 RHODE ISLAND	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
45 S CAROLINA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
46 S DAKOTA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
47 TENNESSEE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
48 TEXAS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
49 UTAH	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
50 VERMONT	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
51 VIRGINIA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table 30 (continued):

55 WASHINGTON	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
56 W VIRGINIA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
57 WISCONSIN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
58 WYOMING	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
US TOTALS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

9/2/76

low, with 50+% of the total emanating from North and South Carolina.

The total state emissions from textile manufacturing (Table 30) divided by the state totals for each criteria pollutant from all air pollution sources (from Table 31) yields the percentage attributed to the textile industry per state. For example textile plants in Alabama emit 2,332 x 10^3 kg/yr of particulate, whereas 2,118,000 x 10^3 kg (Table 31) are emitted from all sources in the state. Therefore, 0.1% of the particulates in the state are from textile sources.

In Table 31, the percentage value below the mass emission value represents the state's contribution to the national burden of a specific criteria pollutant expressed as a percent of the U.S. total. Using the example in Alabama, the 2,118,000 x 10^3 kg of total particulates emitted account for 1.64% of the total mass emission of particulates from all sources in the U.S.

The national listing of criteria pollutants emitted from each textile manufacturing source is shown in Table 32. For each source and each criteria pollutant, the first line represents the annual mass emissions of each pollutant from each source. For example, the source "Breaking and Scutching Flax Fibers" emits 21.4 x 10^3 kg/yr of particulates in the U.S. The second line represents for each source and criteria pollutant, the percentage that the source represents with respect to all textile sources. For the source "Break- "Breaking and Scutching Flax Fibers" the 21.4 x 10^3 kg/yr of particulates represents 0.0617% of the particulate emissions from all textile sources in the U.S. The third line for this same source shows the percent of emissions from all sources of air emissions. Hence, 21.4 x 10^3 kg/yr of

Table 31. MASS EMISSIONS OF CRITERIA POLLUTANTS PER STATE FROM ALL SOURCES IN U.S. AND PERCENT OF U.S. TOTAL

STATE TOTALS FOR 18 MAY 1977 — MASS OF EMISSIONS (1000 KG/YR)
PERCENT OF US TOTALS

	STATE	PART	SOX	NOX	HC	CO
1	ALABAMA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	ALASKA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3	ARIZONA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4	ARKANSAS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5	CALIFORNIA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6	COLORADO	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7	CONNECTICUT	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8	DELAWARE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9	FLORIDA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	GEORGIA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11	HAWAII	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12	IDAHO	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
13	ILLINOIS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
14	INDIANA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
15	IOWA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
16	KANSAS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
17	KENTUCKY	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
18	LOUISIANA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
19	MAINE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
20	MARYLAND	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
21	MASSACHUSETTS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
22	MICHIGAN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
23	MINNESOTA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
24	MISSISSIPPI	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

28	MISSOURI	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
30	MONTANA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
31	NEBRASKA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
32	NEVADA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
33	NEW HAMPSHIRE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
34	NEW JERSEY	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
35	NEW MEXICO	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
36	NEW YORK	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
37	N CAROLINA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
38	N DAKOTA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
39	OHIO	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
40	OKLAHOMA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
41	OREGON	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
42	PENNSYLVANIA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
44	RHODE ISLAND	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
45	S CAROLINA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
46	S DAKOTA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
47	TENNESSEE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
48	TEXAS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
49	UTAH	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
50	VERMONT	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
51	VIRGINIA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
53	WASHINGTON	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
54	W VIRGINIA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
55	WISCONSIN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
56	WYOMING	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	US TOTALS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

LINE	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

[illegible]

Table 32 (continued).

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table 32 (continued).

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

| | | |

particulates from the source "Breaking and Scutching Flax Fibers" represents 0.000028 of the total national particulate emissions.

Approximately 81% of particulates from textile operations are caused by cotton handling activities (carding, combing, preparation, and fabric manufacturing). Particulates from all textile operations account for 0.025% of the national total. Approximately 75% of the mass hydrocarbon loads are generated by the printing of cotton and rayon. Textile hydrocarbon emissions comprise 0.0078% of the national total. Singeing cotton generates the nitrogen oxides, sulfur oxides, and carbon monoxide emissions from textile processes. Pollutant [illegible]m this operation represent <0.001% of the national mass emissions.

D. PRIORITIZATION

Preliminary prioritizations were compiled with respect to the source types and SIC Codes shown earlier. The methodology used to generate impact factors for the prioritizations of these location sensitive sources is explained in Reference 4. As previously stated, a source type listing, shown in Table 33, was first used to represent only that data available in the literature from which estimates could be made. The SIC Code listing developed subsequently was found to provide a more comprehensive, logical, and organized basis for prioritizing sources within textile manufacturing. The source types were included under the appropriate SIC Codes shown in Table 34 to obtain the present SIC prioritization (Table 35). Any further investigations of textile manufacturing sources should use SIC Codes as the basis for defining source type.

Table 11. PRIORITIZATION OF TEXTILE MANUFACTURING SOURCES WITH RESPECT TO SOURCE TYPE

SOURCE TYPE	IMPACT FACTOR	IA	EALF
PREPARATION OF COTTON FIBRES	99,000,000	1	1
DRAWING AND SPINNING COTTON FIBRES	99,000,000	1	1
KNITTING COTTON FABRICS	10,000,000	1	1
MANUFACTURE OF COTTON FABRICS	9,000,000	1	1
CARDING OF COTTON FIBRES	9,000,000	1	1
KNITTING SYNTHETIC POLYMER FABRICS	9,000,000	1	1
SPINNING ASBESTOS FIBRES - TWISTING AND WINDING	810,000	1	1
WEAVING SYNTHETIC POLYMER FABRICS	100,000	1	1
DYEING RAYON FABRICS	100,000	1	1
DYEING COTTON FABRICS	100,000	1	1
PREPARATION OF ASBESTOS FIBRES	100,000	1	1
KNITTING WOOL FABRICS	100,000	1	1
MANUFACTURE AND PROCESSING OF ROPE	100,000	1	1
SPINNING OF COTTON FIBRES	100,000	1	1
CARDING ASBESTOS FIBRES	100,000	1	1
CARDING ASBESTOS FIBRES	100,000	1	1
KNITTING NATURAL POLYMER FABRICS	100,000	1	1
MANUFACTURE OF ASBESTOS PRODUCTS - WEAVING	10,000	1	1
KNITTING SILK FABRICS	100,000	1	1
PREPARING AND SCUTCHING FLAX FIBRES	100,000	1	1
FELTSUITING RAYON FABRICS	90,000	1	1
KNITTING LINEN FABRICS	90,000	1	1
FELTSUITING WOOL FABRICS	90,000	1	1
SPINNING SYNTHETIC POLYMERS	90,000	1	1
DRAWING AND SPINNING FLAX FIBRES	90,000	1	1
FELTSUITING COTTON FABRICS	90,000	1	1
CARDING FLAX FIBRES	90,000	1	1
FELTSUITING NATURAL POLYMER FABRICS	90,000	1	1
FELTSUITING SYNTHETIC POLYMER FABRICS	90,000	1	1
CARDING WOOL FIBRES	81,000	1	1
CARPET DYEING AND DRYING SYNTHETIC POLYMERS	81,000	1	1
MANUFACTURE OF LINEN CLOTH	9,000	1	1
CARPET WEAVING - FLAX	9,000	1	1
CARBONIZING WOOL FIBRES	9,000	1	1
FELTSUITING SILK FABRICS	9,000	1	1
SPINNING WOOL FIBRES	9,000	1	1
FELTSUITING LINEN FABRICS	9,000	1	1
CARPET WEAVING - COTTON	9,000	1	1
KNITTING COTTON FABRICS	11,000	1	1
DRAWING AND SPINNING WOOL FIBRES	11,000	1	1
CARPET DYEING AND DRYING WOOL	900	1	1
SPINNING RAYON FIBRE	900	1	1
MILLING WOOL FABRICS	900	1	1
MANUFACTURE OF WOOL CLOTH	900	1	1
CARPET DYEING AND DRYING RAYON FABRICS	900	1	1
CARPET KNITTING SYNTHETIC POLYMERS	900	1	1
SCOURING WOOL FIBRES	900	1	1
SCOURING NATURAL POLYMER FIBRES	100	1	1
CARPET DYEING AND DRYING FLAX	90	1	1
DYEING RAYON FABRICS	90	1	1
CARPET DYEING AND DRYING NATURAL POLYMER FABRICS	90	1	1
CARPET DYEING AND DRYING COTTON	90	1	1
DYEING WOOL FABRICS	90	1	1
DYEING AND DRYING WOOL FIBRE STOCK	90	1	1
DYEING NATURAL POLYMER FABRICS	90	1	1
DYEING SILK FABRICS	1	1	1
DYEING LINEN FABRICS	1	1	1
SCOURING LINEN FABRICS	1	1	1
FELTING WOOL FABRICS	1	1	1

8/26/76

Table 14. IMPACT FACTORS FOR TEXTILE MANUFACTURING SOURCES BY SIC CODE

Source	Impact factor
SIC Code 221, Cotton Weaving Mills	
1. Printing cotton fabrics	10,000,000
2. Manufacture of cotton fabrics	4,000,000
3. Dyeing cotton fabrics	700,000
4. Finishing cotton fabrics	20,000
5. Singeing cotton fabrics	1,000
SIC Code 222, Man-Made Fiber and Silk Weaving Mills	
1. Printing synthetic polymer fabrics	2,000,000
2. Dyeing synthetic polymer fabrics	700,000
3. Printing rayon fabrics	700,000
4. Printing natural polymer fabrics	200,000
5. Printing silk fabrics	100,000
6. Finishing rayon fabrics	50,000
7. Finishing natural polymer fabrics	10,000
8. Finishing synthetic polymer fabrics	10,000
9. Finishing silk fabrics	8,000
10. Dyeing rayon fabrics	60
11. Dyeing natural polymer fabrics	20
12. Dyeing silk fabrics	9
SIC Code 223, Wool Weaving and Finishing Mills	
1. Printing wool fabrics	400,000
2. Finishing wool fabrics	30,000
3. Dyeing wool fabrics	40

Table 14 (continued). IMPACT FACTORS FOR TEXTILE MANUFACTURING SOURCES BY SIC CODE

Source	Impact factor
SIC Code 2261, Cotton Finishing Plants	
1. Printing cotton fabrics	10,000,000
2. Dyeing cotton fabrics	700,000
3. Finishing cotton fabrics	20,000
4. Singeing cotton fabrics	1,000
SIC Code 2262, Man-Made Fiber and Silk Finishing Plants	
1. Printing synthetic polymer fabrics	2,000,000
2. Dyeing synthetic polymer fabrics	700,000
3. Printing rayon fabrics	700,000
4. Printing natural polymer fabrics	200,000
5. Printing silk fabrics	100,000
6. Finishing rayon fabrics	50,000
7. Finishing natural polymer fabrics	10,000
8. Finishing synthetic polymer fabrics	10,000
9. Finishing silk fabrics	8,000
10. Dyeing rayon fabrics	60
11. Dyeing natural polymer fabrics	20
12. Dyeing silk fabrics	9
SIC Code 227, Floor Covering Mills	
1. Carpet dyeing and drying synthetic polymers	10,000
2. Carpet backing-flax	9,000
3. Carpet backing-cotton	1,000
4. Carpet dyeing and drying wool	700
5. Carpet dyeing and drying rayon fabrics	100
6. Carpet backing synthetic polymers	200
7. Carpet dyeing and drying flax	80
8. Carpet dyeing and drying natural polymer fabrics	60
9. Carpet dyeing and drying cotton	40

Table 14 (continued). IMPACT FACTORS FOR TEXTILE MANUFACTURING SOURCES BY SIC CODE

Source	Impact factor
SIC Code 2281, Yarn Mills Except Wool	
1. Preparation of cotton fibers	90,000,000
2. Drawing and spinning cotton fibers	20,000,000
3. Carding of cotton fibers	2,000,000
4. Combing of cotton fibers	300,000
5. Spinning synthetic polymers	30,000
6. Spinning rayon fiber	500
7. Spinning natural polymer fibers	100
SIC Code 2282, Wool Yarn Mills	
1. Carbonizing wool fibers	8,000
2. Carding wool fibers	10,000
3. Combing wool fibers	8,000
4. Drawing and spinning wool fibers	1,000
5. Oiling wool fiber	300
6. Manufacture of wool cloth	300
7. Scouring wool fibers	200
8. Dyeing and drying wool fiber stock	30
SIC Code 2291, Felt Goods Except Woven Felts and Hats	
1. Felting wool fabrics	1
SIC Code 2298, Cordage and Twine	
1. Manufacture and processing of rope	400,000
SIC Code 2299, Miscellaneous Textile Goods	
1. Printing linen fabrics	50,000
2. Breaking and scutching flax fibers	100,000
3. Drawing and spinning flax fibers	30,000

Table 14 (continued). IMPACT FACTORS FOR TEXTILE MANUFACTURING SOURCES BY SIC CODE

Source	Impact factor
SIC Code 2299 (continued)	
4. Combing flax fibers	20,000
5. Manufacture of linen cloth	9,000
6. Finishing linen fabrics	1,000
7. Dyeing linen fabrics	4
8. Singeing linen fabrics	1
Other Sources	
1. Spinning asbestos fibers - twisting and winding	800,000
2. Preparation of asbestos fibers	400,000
3. Carding asbestos fibers	300,000
4. Combing asbestos fibers	300,000
5. Manufacture of asbestos products - weaving	200,000

Table 15. PRIORITIZATION OF TEXTILE MANUFACTURING SOURCES WITH RESPECT TO SIC CODE

SIC code	Title	Impact factor
2281	Yarn Mills Excluding Wool	1.1×10^8
221	Cotton Weaving Mills	1.5×10^7
2261	Cotton Finishing Plants	1.1×10^7
2262	Man-Made Fiber and Silk Finishing Plants	1.8×10^6
222	Man-Made Fiber and Silk Weaving Mills	1.8×10^6
-	Asbestos Sources	2.0×10^5
223	Wool Weaving and Finishing Mills	4.3×10^5
2298	Cordage and Twine	4.0×10^5
2299	Miscellaneous Textile Goods, N.E.C.	2.1×10^5
2283	Wool Yarn Mills	2.7×10^5
227	Floor Covering Mills	2.2×10^5
2291	Felt Goods Excluding Woven Hats	1
225	Knitting Mills	-
2269	Finishing Plants, N.E.C.	-
2282	Throwing and Winding Mills	-
2284	Thread Mills	-
2292	Lace Goods	-
2293	Paddings and Fillings	-
2294	Processing Waste	-
2295	Coated Fabrics Not Rubberized	-
2296	Tire Cord and Fabrics	-
2297	Nonwoven Fabrics	-
2241	Narrow Fabric Mills	-

Asbestos emitting sources, which are not part of Major Group 22, are contained in the prioritization listing because of the significance of this mineral fiber in the environment.

Cotton textiles represent the top five source types having the greatest potential environmental impact as shown in Table 33. Four of these source types are concerned with the handling of cotton. These operations occur at yarn mills, SIC 2281 (Table 34), and at cotton weaving mills, SIC 2211 (Table 34), and account for the top ranking of these two industries in the prioritization listing by SIC Code shown in Table 35. The other source type with an impact factor in the top five in Table 33 is the printing of cotton fabrics. This operation occurs in SIC 2211, cotton weaving mills, and in SIC 2261, cotton finishing plants. These two industries are ranked second and third in the SIC Code prioritization listing in Table 35.

SECTION IV

GLOSSARY

AGEING - Process in which fabric is allowed to dry prior to washing.

AMMONIATING - Process in which yarn or fabric is passed through a weak solution of ammonia then through hot water as it is stretched, thus increasing the strength, luster, dimensional stability, and affinity for dyes.

BLEACHING - Process in which all the natural color is removed from yarns and fabric.

BLENDING - Combination of different types of fibers in formation of blended fibers, or mixing together parts of several bales of cotton resulting in greater uniformity.

BRAIDING - A form of fabric construction that is made by interfacing three or more strands of yarn so that each strand passes over and under one or more of the others.

BRUSHING - Process which removes loose, short-cut fibers which have dropped into the nap, and lays the nap in one direction.

BURLING - Process in which snarls, snubs, straws, etc., are removed from the warp threads and the filling threads.

CARBONIZING - The process whereby vegetable matter is chemically removed from wool by means of acids or salts.

CARDING - The initial process used in disentangling and combing out fibers of wool, flax, etc., preparatory to spinning.

COATING - Any finish applied to a tufted carpet or rug to create certain desirable properties.

COMBING - An operation, in addition to carding, in which fibers are straightened and arranged with a high degree of parallelism by the use of fine-tooth combs.

CRABBING - An operation in which fabric is stretched or loosened where necessary and set such that there is no strain on any portion of the fabric. The cloth passes over rollers into hot water or steam, then into cold water, after which it is pressed.

CRIMPING - Process in which straight fibers are made wavy.

CUTTING - Operation in which filament fibers are sheared into staple fiber lengths.

DAMPENING - A process by which goods are wetted. Dampening is one of three operations used in cold-water shrinking.

DESIZING - An operation in which the size is dissolved from woven fabric. (See Slashing)

DRAWING - An operation in which slivers of fibers are doubled and redoubled. The process draws, twists, and winds the stock.

DYEING - A process in which a fiber, yarn, or fabric is impregnated with a dyestuff.

FABRIC - A cloth made by weaving, knitting, or felting fibers.

FELTING - Process by which fibers are pressed, rather than woven, into a compact fabric.

FIBER - A fine threadlike piece, as of cotton, jute or asbestos.

FILAMENT - A single element of a textile fiber (as silk), or mechanically produced fiber (as rayon or nylon).

FRAMING - Stretching of fabrics on a rack structure to apply finishes or treatments, especially tenter framing which dries and evens the fabric width.

FULLING - An important operation in the finishing of wool fabrics which actually operates as a preshrinking process for wool. The fibers are cleaned, secured, and condensed by a combination of moisture, heat, soap, and pressure.

GARNETTING - A picking and shredding operation by which re-processed and reused wool fibers are obtained by separately reducing the unused and used materials to a fibrous mass.

GILLING - Operation in which yarn is run through comb like spikes to effect parallelization of the fibers.

GRAY GOODS - A term used to denote fabric which is discolored due to exposure.

GREY GOODS - A term also known as greige goods, used to denote any unfinished fabric as it comes from the loom.

HACKLING - A simple combing process whereby flax fibers are straightened and long staple is separated from the short staple.

KNITTING - Operation by which fabric is formed by looping a continuous yarn.

MERCERIZING - A process in which cotton yarns or fabric is treated with caustic alkali under tension, thus increasing strength, luster, and affinity for dyes.

NEEDLING - The insertion of barbed needles into fiber webs in order to entangle the fibers.

OILING - Treatment of fiber with one of various oils, including animal, vegetable, and mineral, or a blend of these to keep it from becoming brittle and to lubricate it for the spinning operation.

OPENING - Process in which bales of cotton move through an opening machine where the compressed masses of raw fiber are loosened and exposed to the atmosphere.

PICKING - Inserting of filling yarn by means of casting a shuttle from one side of the loom to the other.

PRINTING - Process in which a pattern or design is imprinted on a fabric in one or more colors by using dyes in a paste form or some related means.

ROVING - A strand of loosely assembled fibers, wool, cotton, etc., preparatory to spinning.

SCOURING - A step preparatory to manufacturing in which goods are thoroughly washed in an alkaline solution to remove impurities.

SCUTCHING - Removal of small pieces of bark, called shives, thus releasing flax fiber from the stalk.

SHEARING - An operation in which fabrics are processed through rotating spiral blades to promote an attractive smooth surface to the cloth.

SHORT-STAPLE - A particular length, degree, and fineness of cotton, wool, flax, and other natural fibers.

SINGEING - Rapidly passing gray goods over gas flames to burn off lint and threads as well as all fuzz and fiber ends.

SLASHING - Also known as sizing - an operation in which yarn is coated (for example with starch) to prevent chafing or breaking during the weaving process.

SLIVER - A product of the cotton process, a sliver is a continuous, untwisted strand of cotton fibers.

SOFTENING - Process of applying a finish to the fibers or yarn to improve the "hand" of the fabric.

SORTING - The arranging of wool fleece by color into various piles for processing.

SPINNING - Technique for changing fibrous substances into yarn or thread.

SPOOLING - Operation in which yarn is wound on a spool or cone for use in weaving.

STIFFENING - The application of pressure and steam to saturated batts of wool to harden the fibers through increased interlocking.

TEXTURIZING - The operations which change the surface or shape and texture of filament fibers.

THROWING - Process in which reeled silk is transferred into silk yarn. Throwing is analogous to the spinning process that manufactures cotton, linen, or wool fibers into yarn.

TOW - Short-staple fibers straightened and formed into a sliver for further processing.

TUFTING - Process in which yarn is punched through a ground fabric (backing), used in rug and carpet production.

TWISTING - Combining two or more strands or threads by winding together.

WARPING - Operation in which yarns are placed on a large rack or frame and immersed in a solution.

WASHING - Detergent operation which removes dirt and excess dyes and printing materials from fabric.

WEAVING - Interlacing threads, yarns, strips, fibrous material, etc., in order to form a fabric or texture.

WEB BONDING - Process that applies adhesive to fabric or yarns causing a permanent bond between materials.

WEB FORMATION - The creation of an interlaced network of fibers (including waste) for bonding.

WINDING - Wrapping yarn or thread onto spools, bobbins, or reels.

YARN - Fibers drawn, twisted, and spun together to form the basis to fabrics used in knitting and weaving.

SECTION V

CONVERSION FACTORS[1]

To convert from	to	Multiply by
kilogram (kg)	pound-mass (lb mass avoirdupois)	2.205
kilogram (kg)	ton (short, 2,000 lb mass)	1.102×10^{-3}
kilogram (kg)	metric ton	1.000×10^{-3}
meter (m)	yard	1.094
metric ton	pound	2.205×10^{-3}

Prefix	Symbol	Multiplication factor	Example
kilo	k	10^3	1 kg = 10^3 grams

[1] "Metric Practice Guide," American Society for Testing and Materials, Philadelphia, ASTM Designation: E-380-74, November 1974, 35 p.

SECTION VI

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